Module description Catalog Program in Data Science

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

2024

**TABLE OF CONTENTS**

**Module description Catalog Program in Data Science**

[**1. General Education 5**](#_heading=h.44sinio)

[1. Marxist-Leninist Philosophy - BAA00101 5](#_heading=h.1y810tw)

[2. Marxist-Leninist Political Economy - BAA00102 6](#_heading=h.4i7ojhp)

[3. Scientific Socialism - BAA00103 7](#_heading=h.q1o6owd48v20)

[4. History of Vietnamese Communist Party - BAA00104 9](#_heading=h.3whwml4)

[5. HoChiMinh’s Ideology - BAA00003 10](#_heading=h.2bn6wsx)

[6. General Law - BAA00004 12](#_heading=h.3as4poj)

[7. General Economics - BAA00005 13](#_heading=h.1pxezwc)

[8. Psychology - BAA00006 15](#_heading=h.49x2ik5)

[9. Group-working and Learning Skills - BAA00008 17](#_heading=h.2p2csry)

[10. English 1 - BAA00011 17](#_heading=h.1v1yuxt)

[11. English 2 - BAA00012 19](#_heading=h.37m2jsg)

[12. English 3 - BAA00013 20](#_heading=h.206ipza)

[13. English 4 - BAA00014 21](#_heading=h.3ygebqi)

[14. Calculus 1B - MTH00003 22](#_heading=h.1rvwp1q)

[15. Calculus 1B Practice - MTH00081 23](#_heading=h.2r0uhxc)

[16. Calculus 2B - MTH00004 24](#_heading=h.haapch)

[17. Calculus 2B Practice - MTH00082 25](#_heading=h.319y80a)

[18. Linear Algebra - MTH00030 26](#_heading=h.1gf8i83)

[19. Linear Algebra Practice - MTH00083 26](#_heading=h.40ew0vw)

[20. Probability and Statistics - MTH00040 27](#_heading=h.2fk6b3p)

[21. Probability and Statistics Practice - MTH00085 28](#_heading=h.upglbi)

[22. Discrete Mathematics - MTH00041 29](#_heading=h.3ep43zb)

[23. Discrete Mathematics Practice - MTH00086 30](#_heading=h.1tuee74)

[24. Combinatorics - MTH00050 31](#_heading=h.4du1wux)

[25. Fundamentals of Computer Programming - MTH00055 33](#_heading=h.2szc72q)

[26. Computational Software Laboratory - MTH00087 33](#_heading=h.184mhaj)

[27. Introduction to Information Technology - CSC00004 34](#_heading=h.3s49zyc)

[28. General Environment - ENV00001 36](#_heading=h.279ka65)

[29. Human and Environment - ENV00003 37](#_heading=h.meukdy)

[30. Earth Science - GEO00002 38](#_heading=h.36ei31r)

[31. General Chemistry 1 - CHE00001 39](#_heading=h.1ljsd9k)

[32. General Chemistry 2 - CHE00002 40](#_heading=h.45jfvxd)

[33. General Chemistry Laboratory 1 - CHE00081 41](#_heading=h.2koq656)

[34. General Chemistry Laboratory 2 - CHE00082 42](#_heading=h.zu0gcz)

[35. General Biology I - BIO00001 43](#_heading=h.3jtnz0s)

[36. General Biology II - BIO00002 44](#_heading=h.1yyy98l)

[37. Lab work on General Biology 1 - BIO00081 46](#_heading=h.4iylrwe)

[38. Lab work on General Biology 2 - BIO00082 48](#_heading=h.2y3w247)

[39. General Physics 1 (Mechanics - Thermodynamics) - PHY00001 49](#_heading=h.1d96cc0)

[40. General physics 2 (Electromagnetic - Optics) - PHY00002 51](#_heading=h.3x8tuzt)

[41. Labwork on General Physics - PHY00081 52](#_heading=h.2ce457m)

[42. Introduction to Informatics - CSC00003 53](#_heading=h.rjefff)

[**2. Professional Education Knowledge 55**](#_heading=h.3bj1y38)

[**2.1. Basic knowledge 55**](#_heading=h.1qoc8b1)

[1. Advanced Programming - MTH10107 55](#_heading=h.4anzqyu)

[2. Object Oriented Programming - MTH10407 56](#_heading=h.2pta16n)

[3. Data Structures and Algorithms - MTH10405 57](#_heading=h.14ykbeg)

[4. Introduction to Database systems - MTH10312 58](#_heading=h.3oy7u29)

[5. Computer Networks - MTH10311 58](#_heading=h.243i4a2)

[6. Mathematical Statistics - MTH10404 59](#_heading=h.j8sehv)

[7. Introduction to Data Science - MTH10171 60](#_heading=h.338fx5o)

[**2.2. Required Courses for Specialization 61**](#_heading=h.1idq7dh)

[1. Introduction to Artificial Intelligence - MTH10318 61](#_heading=h.42ddq1a)

[2. Data Mining - MTH10358 63](#_heading=h.2hio093)

[3. Introduction to Machine Learning - MTH10353 64](#_heading=h.wnyagw)

[4. Python for Data Science - MTH10605 65](#_heading=h.3gnlt4p)

[**2.3. Elective Courses for Specialization 66**](#_heading=h.1vsw3ci)

[1. Multivariate Statistics - MTH10619 66](#_heading=h.4fsjm0b)

[2. Analysis of Statistical Data - MTH10513 67](#_heading=h.2uxtw84)

[3. Linear programming - MTH10449 68](#_heading=h.1a346fx)

[4. Optimization Algorithms - MTH10450 69](#_heading=h.3u2rp3q)

[5. Operations Research - MTH10446 70](#_heading=h.2981zbj)

[6. Social Network Analysis - MTH10624 71](#_heading=h.odc9jc)

[7. Mathematical Finance Models - MTH10203 72](#_heading=h.38czs75)

[8. Database Management System - MTH10344 73](#_heading=h.1nia2ey)

[9. Introduction to Big Data - MTH10606 74](#_heading=h.47hxl2r)

[10. Advanced Artificial Intelligence - MTH10356 75](#_heading=h.2mn7vak)

[11. Parallel Programming - MTH10352 76](#_heading=h.11si5id)

[12. Advance Machine Learning - MTH10354 77](#_heading=h.3ls5o66)

[13. Data visualization - MTH10608 78](#_heading=h.20xfydz)

[14. Numerical Methods for Data Science - MTH10607 80](#_heading=h.4kx3h1s)

[15. Deep Learning for Data Science - MTH10622 81](#_heading=h.302dr9l)

[16. Recommender System - MTH10623 82](#_heading=h.1f7o1he)

[17. Seminar on Data Science - MTH10620 83](#_heading=h.3z7bk57)

[**3. Graduation works 84**](#_heading=h.2eclud0)

[1. Graduation Thesis - MTH10595 84](#_heading=h.thw4kt)

[2. Internship - MTH10549 85](#_heading=h.3dhjn8m)

[3. Soft Skill - MTH10626 86](#_heading=h.1smtxgf)

[4. Entrepreneurship - MTH10627 87](#_heading=h.4cmhg48)

[5. Graduation Project - MTH10597 88](#_heading=h.2rrrqc1)

# **1.** **General Education**

### Marxist-Leninist Philosophy - BAA00101

|  |  |
| --- | --- |
| Module designation | Marxist-Leninist Philosophy |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | Lecturers at School of Political and Administration Sciences,  VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 135 Hours  Contact hours: Lectures: 45 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 3 credits (4.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | The course equips students with the basic contents of the worldview and the Marxist-Leninist philosophical methodology.  Helping students apply knowledge about the worldview, Marxist-Leninist philosophy, and philosophy creatively in cognitive and practical activities, to solve problems that the social life of a country or of the time being set. |
| Content | Marxist-Leninist philosophy is a course in the Marxist-Leninist knowledge block and Ho Chi Minh Thought. This module equips students with basic, general, and systematic knowledge of the problems of Marxist-Leninist philosophy. From there, learners have a basis and reasonable research and learning methods and apply them to the process of evaluating life phenomena. |
| Examination forms | * Class discussion; * Group presentations and reports; * Mid-term exam: essay (opened-book); * Final exam: essay (closed-book) |
| Study and examination requirements | 1. Regulations for group presentations    1. Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.    2. Week 4 (4th session) begins to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.    3. Submission form: submit files and minutes of group work via email to the lecturer. 2. Regulations on time, attendance and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have test scores, lively discussions, constructive and serious statements in class. |
| Reading list | 1. Textbook of basic principles of Marxism-Leninism, National Political Publishing House of Vietnam. 2. Textbook of Marxist-Leninist Philosophy, National Political Publishing House of Vietnam. |

### Marxist-Leninist Political Economy - BAA00102

|  |  |
| --- | --- |
| Module designation | Marxist-Leninist Political Economy |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | Lecturers at School of Political and Administration Sciences,  VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours:  Lectures: 30 hours (in class)  Private study: 60 hours (self-study) |
| Credit points | 2 credits (3 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Firstly, equip students with basic and core knowledge of Marxist-Leninist political economy in the context of economic development of the country and the world today. Ensure the basic, systematic, scientific, updating new knowledge, associate with practice, creativity, skills, thinking, learner quality, connectivity to overcome duplication, enhance integration and reduce the load, reduce content that is no longer relevant or scholastic content for students at non-theoretical colleges and universities.  Second, on that basis, forming thinking and analytical skills, assessing and identifying the nature of economic benefit relations in the country's socio-economic development, contributing to helping students build appropriate social responsibility in the job position and life after graduation.  Third, contribute to building the stance and ideology of Marxism-Leninism towards students. |
| Content | The program consists of six chapters: in which chapter one discusses the objects, research methods, and functions of the Marxist-Leninist Political Economy. Chapters 2 to 6 present the core content of the Marxist-Leninist political economy according to the subject's objectives. Specifically, issues such as goods, markets and the role of actors in the market economy; Producing surplus value in a market economy; Competition and monopoly in the market economy; Socialist-oriented market economy and economic interest relations in Vietnam; Industrialization, modernization, and international economic integration in Vietnam. |
| Examination forms | * Class discussion; * Group presentations and reports; * Mid-term exam: essay (opened-book); * Final exam: essay (closed-book). |
| Study and examination requirements | 1. Regulations for group presentations:    1. Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.    2. Week 4 (4th session) begins to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.    3. Submission form: submit files and minutes of group work via email to the lecturer. 2. Regulations on time, attendance, and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class. |
| Reading list | Mac-Leninist political economy textbook for undergraduates who are not majoring in political economy. |

### Scientific Socialism - BAA00103

|  |  |
| --- | --- |
| Module designation | Scientific Socialism |
| Code, if applicable | BAA00103 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at School of Political and Administration  Sciences, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | lecture, lesson, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours:  Lectures: 30 hours (in class)  Private study: 60 hours (self-study) |
| Credit points | 2 credits (3 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | The subject equips students with the basic contents of scientific socialism (one of the three components constituting Marxism-Leninism).  Helping students apply basic knowledge of scientific socialism creatively in cognitive and practical activities, solving problems that the social life of a country, of the times being set. |
| Content | The subject equips students with the basic contents of scientific socialism (one of the three components constituting Marxism-Leninism). Helping students apply basic knowledge of scientific socialism creatively in cognitive and practical activities, solving problems that the social life of a country, of the times being set. |
| Examination forms | * Class discussion; * Group presentations and reports; * Mid-term exam: essay (opened-book); * Final exam: essay (closed-book). |
| Study and examination requirements | 1. Regulations for group presentations    1. Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.    2. Week 4 (4th session) begins to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.    3. Submission form: submit files and minutes of group work via email to the lecturer. 2. Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) |
| Reading list | 1. Textbook of Scientific Socialism, National Political Publishing House of Vietnam. 2. The Basic Principles of Marxism-Leninism, National Political Publishing House of Vietnam. |

### History of Vietnamese Communist Party - BAA00104

|  |  |
| --- | --- |
| Module designation | History of Vietnamese Communist Party |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at School of Political and Administration  Sciences, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours:  Lectures: 30 hour (in class)  Private study: 60 hours (self-study) |
| Credit points | 2 credits (3 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | In terms of content: providing systematic and basic knowledge about the birth of the Communist Party of Vietnam (1920-1930), the Party's leadership over the Vietnamese revolution during the period of political struggle. government authority (1930-1945), in two resistance wars against French colonialism and American imperialism (1945-1975), in the cause of national construction and defense during the country's transition to socialism. association, conducting renovation work (1975-2018).  Ideologically: Through historical events and experiences on the leadership of the Party to build a sense of respect for objective truths, raise pride and confidence in the Party's leadership cause.  About skills: Equipping with scientific thinking methods on history, skills in choosing research materials, studying subjects and the ability to apply historical awareness to practical work, criticizing misconceptions on the history of the Party. |
| Content | The course provides systematic and fundamental knowledge about the birth of the Communist Party of Vietnam (19201930), the Party's leadership for the Vietnamese revolution during the period of struggle for power ( 1930-1945), during the two resistance wars against the French colonialists and the American imperialists (1945-1975), in the cause of national construction and defense during the period of the whole country's transition to socialism, conducted doi moi (1975-2018). Through historical events and experiences in the leadership of the Party to build a sense of respect for objective truth, heighten pride and confidence in the Party's leadership cause. Equip with scientific thinking methods on history, skills in choosing research materials, studying subjects, and the ability to apply historical awareness to practical work, and criticize misconceptions about the history of the Party. |
| Examination forms | * Class discussion; * Group presentations and reports; * Mid-term exam: essay (opened-book); * Final exam: essay (closed-book). |
| Study and examination requirements | 1. Regulations for group presentations    1. Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.    2. Week 4 (4th session) begins to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.    3. Submission form: submit files and minutes of group work via email to the lecturer. 2. Regulations on time, attendance and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have test scores, lively discussions, constructive and serious statements in class. |
| Reading list | Curriculum of the History of the Communist Party of  Vietnam, Issued by the Ministry of Education and Training. |

### Ho Chi Minh’s Ideology - BAA00003

|  |  |
| --- | --- |
| Module designation | HoChiMinh’s Ideology |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | Lecturers at School of Political and Administration  Sciences, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours: Lectures = 30 hour (in class) Private study: 60 hours (self-study) |
| Credit points | 2 credits (3 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | About knowledge: Equip students with basic knowledge about the concept, origin, the process of formation and development of Ho Chi Minh thought; the basic contents of Ho Chi Minh's thought; the application of the Communist Party of Vietnam in the national-democratic revolution and the socialist revolution, in the current national renewal process.  About skills: Helping students to think, analyze, evaluate, and creatively apply Ho Chi Minh's Thoughts to solve problems in real life, study, and work.  About attitudes: Helping students improve their political bravery, patriotism, loyalty to the goal, the ideal of national independence associated with socialism; aware of the role and value of Ho Chi Minh's thought for the Vietnamese Party and nation; realize their responsibility in studying and training to contribute to the construction and defence of the country. |
| Content | Description of course content: the subject equips students with basic knowledge about objects, research methods, and learning meanings of Ho Chi Minh's ideology; on the basis, of the process of formation and development of Ho Chi Minh thought; on national independence and socialism; on the Communist Party and the State of Vietnam; on great national and international solidarity; about culture, ethics, people. |
| Examination forms | * Class discussion; * Group presentations and reports; * Mid-term exam: Multiple choice (closed-book) or essay (opened-book); * Final exam: Essay (opened-book) |
| Study and examination requirements | 1. Regulations for group presentations    1. Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.    2. Week 4 (4th session) begin to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.    3. Submission form: submit files and minutes of group work via email to the lecturer. 2. Regulations on time, attendance, and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class. |
| Reading list | 1. Textbook of Ho Chi Minh's Thoughts, National Political Publishing House of Vietnam. 2. Study Guide for Ho Chi Minh's Thoughts, Ho Chi Minh City National University Publishing House. |

### General Law - BAA00004

|  |  |
| --- | --- |
| Module designation | General Law |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | Lecturers at School of Political and Administration  Sciences, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, seminars |
| Workload (incl. contact  hours, self-study hours) | Total workload: 135 hrs  Contact hours (lectures): 45 hrs  Private study including examination preparation, specified in hours: 90 hrs |
| Credit points | 3 (4.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. General Objective: Understand the basic legal concepts and terms related to the country's legal system and state apparatus; apply legal provisions to solve some simple case studies; help students form and develop some skills such as looking up legal documents, analyzing legal regulations, and working in groups, thereby improving their sense of survival, learning and working following the Constitution and regulations. The law, the right behavior orientation in life. 2. Specific objectives/course output standards:    1. Knowledge: Present basic legal concepts and terms related to the state apparatus and the Vietnamese legal system; Solve some exercise cases based on the provisions of a law book in the legal system of Vietnam.    2. Skills: Analyzing legal regulations; Lookup legal documents; Working group.    3. Attitude, diligence: Raise awareness of living, studying, and working following the Constitution and the law. |
| Content | The module provides knowledge about the structure of the State apparatus as well as the functions, authority, and legal status of agencies in the State apparatus of the Socialist Republic of Vietnam in terms of economic management, Legal nature, and structure of the system of legal documents. From an overview of the system of legal branches in our State's legal system, a course is devoted to studying the basic contents of administrative law, civil law, and criminal law as branches of law. the main law (original branches of law) of the legal system, so that learners can easily access themselves to other branches of law arising from these major branches of law. |
| Examination forms | Written exam, Multiple choices, Oral presentation |
| Study and examination  requirements | Minimum attendance at lectures is 80% Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. General Law textbook, Ho Chi Minh City University of Law 2. Textbook of Theory of State and Law, Hanoi University of Law |

### General Economics - BAA00005

|  |  |
| --- | --- |
| Module designation | General Economics |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Le Nhan My |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture |
| Workload (incl. contact  hours, self-study hours) | (Estimated) Total workload: 90 hours.  Contact hours (lecture): 30 hours.  Private study including examination preparation, specified in hours: 60 hours. |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | 1. Knowledge:    1. Forming and developing (one step) capacity to collect information, skills to synthesize and systematize issues in an overall relationship; skills to compare, analyze, comment, and evaluate micro-economic issues.    2. Grasp the basic content of Microeconomics - a part of economics. 2. Specifically:    1. Understand the theory of economic choice, the influence of the law of scarcity, and economic models on economic choice.    2. Understand the theory of supply and demand.    3. Understand the theory of consumer behavior.    4. Understand the theory of producer behavior.    5. Understand the theory of competition and monopoly.    6. Understand the theory of factor markets.    7. Understand the theory of the role of government.    8. Understand the analysis of the influence of factors on the balance of the market, in terms of skills.    9. Having the ability to apply the knowledge learned to study the nature of economic phenomena, the laws, and trends of the phenomena, and the laws of the market economy.    10. Ability to apply the knowledge learned in the study of macroeconomics, development economics, and several other economic subjects. 3. Skills:    1. Forming and developing (one step) capacity to collect information, skills to synthesize and systematize issues in an overall relationship; skills to compare, analyze, comment, and evaluate micro-economic issues.    2. Develop reasoning and public speaking skills. Attitude:    3. Trying to be righteous in recognizing and evaluating the lines, policies, and laws of the State of Vietnam in the development of the market economy with the state's regulation. 4. Other Objectives:    1. Through presentations and problem-solving. Forming and developing collaboration and teamwork skills.    2. Develop skills of creative thinking, discovery, and discovery.    3. Cultivate and develop assessment and self-assessment capacity.    4. Develop public speaking and commenting skills. |
| Content | The course presents some basic problems of economics; principles of economics, supply and demand patterns and market equilibrium; theory of consumer behavior and business behavior; types of markets; aggregate supply, aggregate demand, and measure national output.  The module includes the following chapters:  Chapter 1: Economics and Fundamental Issues  Chapter 2: Markets, Supply and Demand, and Market  Equilibrium  Chapter 3: Theory of Consumer Behavior  Chapter 4: Production Cost Theory and Profit Maximization Chapter 5: National Output Measurement, Inflation, and  Unemployment |
| Examination forms | Homework: 20%.  Midterm exam: 20%.  Final exam: 60%. |
| Study and examination requirements | Regulations on time, attendance, and discipline in the course: attend class on time and at least 70% of the sessions (only to be absent for a maximum of 30%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class. |
| Reading list | None |

### Psychology - BAA00006

|  |  |
| --- | --- |
| Module designation | Psychology |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Tran Huong Thao |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact  hours, self-study hours) | (Estimated) Total workload: 90 hours.  Contact hours (lecture): 30 hours.  Private study including examination preparation, specified in hours: 60 hours. |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Knowledge:   1. Understand the system of basic concepts of psychological science and research methods in psychology. 2. Understand the origin, formation and development of psychology and consciousness. 3. Understand the nature of human psychological processes: perception; emotion - affection; act. 4. Identify human psychological states. 5. Understand the psychological attributes that make up the personality structure. Understand the factors affecting the formation and development of personality.   Skills:   1. Developing the capacity to study documents: Analyze, synthesize, compare, and generalize. 2. Form and develop the ability to identify psychological phenomena and apply learned knowledge to solve practical problems. 3. Consulting and consulting skills.   Attitude:   1. Cultivate a passion for learning and studying subjects. 2. Forming a sense of initiative and positivity in self-study. 3. Form the right motivation in learning. 4. Raise a sense of responsibility for group activities.   Other goals:   1. Forming personality qualities in accordance with the requirements of the integration period. 2. Forming communication and behavioral skills in the community. 3. Forming a modern and scientific way of living and working. 4. Forming and developing the ability to think creatively, independently, and critically. 5. Reasoning skills, public speaking skills. 6. Form and develop teamwork skills. |
| Content | The course introduces to learners to acquire basic knowledge about the nature and characteristics of psychological phenomena and basic psychological laws of humans  (perception, emotion, will, etc.) actions and personalities...). On that basis, it helps learners to apply knowledge in practice to identify and distinguish basic psychological phenomena in humans.  This module includes the following parts:  Part 1: The Natural Basis and Social Foundation of Human Psychology.  Part 2: Perception and Learning.  Part 3: Emotions - Affections.  Part 4: Personality and the Formation of Personality.  Part 5: Deviations in Individual Psychological Behavior and Correcting Such Deviant Behavior. |
| Examination forms | * Class discussion; Group presentations and reports. * Mid-term exam: essay (opened book). * Final exam: essay (closed book). |
| Study and examination  requirements | Regulations on time, attendance, and discipline in the course: attend class on time and at least 70% of the sessions (only to be absent for a maximum of 30%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class. |
| Reading list | Main textbook:   1. Nguyễn Quang Uẩn (2015). Giáo trình Tâm lý học đại cương.   References:   1. Plotnik, R, Kouyoumdjian, H (2011). Introduction to Psychology. 2. Berstein, D. A., Penner, L. A., Clarke-Stewart, A., and Roy, E (2008). Psychology. |

### Group-working and Learning Skills - BAA00008

|  |  |
| --- | --- |
| Module designation | Group-working and Learning Skills |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Tran Huong Thao |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | Total: 60 hours  Contact hours: lectures 30 hours (in-class).  Private study: 30 hours (self-study). |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objectives:   1. Specific objectives/subject output standards: Equip students with knowledge and skills about teamwork and study skills. Bringing career orientations to group work practice topics. 2. Skills: teamwork, presentation, communication 3. Attitude, diligence: serious, diligent, positive |
| Content | Understand the concept of groups, how to form groups, classify groups, functions, and tasks of group members. Know the process of teamwork, the necessary skills when working in groups. Able to plan and execute projects. Understand and apply learning skills. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Thuật lãnh đạo nhóm, NXB Trẻ. 2. Học tập cũng cần chiến lược, NXB Lao động Xã hội |

### English 1 - BAA00011

|  |  |
| --- | --- |
| Module designation | English 1 |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | Lecturers at Foreign language centre of University of Science, VNU-HCM |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | Total: 120 hours.  Contact hours: lectures 30 hours; 30 exercise hours.  Private study: 60 hours (self-study) |
| Credit points | 3 Credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Upon completing this course, learners will enhance their basic knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading, and Writing. Here are the objectives in detail:   1. Learners will be able to understand and use vocabulary in various topics such as leisure activities, important life events, emotion, attitude, physical appearance description, travel plans, presenting dreams, countries, people, and languages. 2. Learners can understand and use grammar structures at the pre-intermediate level such as basic tenses and other related matters. 3. Learners will be able to choose the answer that best describes the given picture, choose the correct response to the questions, and understand dialogues and short monologues. 4. Learners will be able to pronounce single words, word clusters and sentences, describe a given picture, and build basic communications in daily life. 5. Learners will be able to comprehend 300-500 words passage of familiar topics and gain more knowledge of different cultures around the world.  * Learners can write essays about familiar topics related to daily life, learning activities, entertainment, events, etc. |
| Content | This course is designed for non-English major students at the University of Science - Vietnam National University -  Hochiminh City, using the first eight modules in the book New Cutting Edge (Pre-intermediate). These modules cover vocabulary, grammar, reading, listening, speaking, and writing in a wide range of topics such as leisure activities, important life events, feelings and emotions, attitudes, physical appearance descriptions, travel plans, presenting dreams, countries, people, and languages. Students need to complete various tasks, including presentations, debates, role-plays, assignments, tests and so on. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: student's book. Harlow: Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: workbook. Harlow: Pearson Education. |

### English 2 - BAA00012

|  |  |
| --- | --- |
| Module designation | English 2 |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | Lecturers at Foreign language centre of University of Science, VNU-HCM |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | Total: 120 hours.  Contact hours: lectures 30 hours; 30 exercise hours.  Private study: 60 hours (self-study) |
| Credit points | 3 Credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | English 1 |
| Module objectives/intended learning outcomes | Upon completing this course, learners will enhance their basic knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail:   1. Learners will be able to understand and use vocabulary in various topics such as everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities, finance- related issues. 2. Learners can understand and use grammar structures in pre-intermediate level such as basic tenses and more complex grammatical structures including conditional sentences, passive, and verb patterns. 3. Learners will be able to choose the correct response for the questions and understand dialogues and short monologues. 4. Learners will be able to pronounce words, generate short conversations, discuss real-life familiar topics, understand, and quickly respond to generated questions, and improve basic communication skills in daily life. 5. Learners will be able to comprehend 500 - 700 words passage of familiar topics and gain more knowledge of different cultures around the world. 6. Learners can write appropriate responses to written requests or complaints in business and social contexts, applying theories into real life practice. |
| Content | This course is designed for non-English major students at the University of Science - Vietnam National University - Ho Chi Minh City, using seven modules (modules 09-15) in the book New Cutting Edge (Pre-intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics such as everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities, and finance-related issues. Students need to complete various tasks, including presentations, debates, role-plays, assignments, tests and so on. |
| Examination forms | Writing (Midterm: 30%, Final exam: 70%) |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: student's book. Harlow: Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: workbook. Harlow: Pearson Education. |

### English 3 - BAA00013

|  |  |
| --- | --- |
| Module designation | English 3 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Foreign language centre of University of Science, VNU-HCM |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | Total: 120 hours.  Contact hours: lectures 30 hours; 30 exercise hours.  Private study: 60 hours (self-study) |
| Credit points | 3 credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | English 2 |
| Module objectives/intended learning outcomes | Upon completing this course, learners will enhance their basic knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail:   1. Learners will be able to understand and use vocabulary in various topics such as leisure activities, important life events, emotion, attitude, physical appearance description, travel plans, dreams, countries, people, and languages. 2. Learners can understand and use new language in a natural, communicative way. 3. Learners will be able to present their opinions about some social and cultural issues and understand dialogues and talks. Learners will be able to comprehend 500-700 words passages of familiar topics and gain more knowledge of different cultures around the world. 4. Learners can write paragraphs about familiar topics related to daily life, learning activities, entertainment, events, etc. |
| Content | This course is designed for non-English majors at the University of Science - Vietnam National University - Ho Chi Minh City, using the first six modules in the book New Cutting Edge (Intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics, namely leisure activities, important life events, feelings and emotions, attitudes, physical appearance descriptions, travel plans, presenting dreams, countries, people, and languages. Students need to complete various tasks, including presentations, debates, role-plays, doing homework, tests and so on. |
| Examination forms | Writing (Midterm: 30%, Final exam: 70%) |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: student's book. Harlow: Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, pre-intermediate: workbook. Harlow: Pearson Education. 3. Materials prepared by the lecturer |

### English 4 - BAA00014

|  |  |
| --- | --- |
| Module designation | English 4 |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | Lecturers at Foreign language centre of University of Science, VNU-HCM |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | Total: 120 hours.  Contact hours: lectures 30 hours; 30 exercise hours.  Private study: 60 hours (self-study) |
| Credit points | 3 credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | English 3 |
| Module objectives/intended learning outcomes | Upon completing this course, learners will enhance their intermediate knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail:   1. Learners can understand and use the language needed in more complex real-life situations in a natural, communicative way. Learners will be able to express their own ideas in interviews, mini-talks, problem-solving and storytelling. 2. Learners will be able to comprehend 700-1000 words passages of up-to-date topics of international interest and learn more about the world and other cultures. 3. Learners can write essays about familiar topics related to daily life, learning activities, entertainment, events, etc. |
| Content | This course is designed for non-English majors at the University of Science - Vietnam National University - Ho Chi Minh City, using six modules (modules 07-12) in the book New Cutting Edge (Intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics namely everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities, and finance-related issues. Students need to complete various tasks, including presentations, debates, role-plays, doing homework, tests and so on. |
| Examination forms | None |
| Study and examination requirements | Mid-term test: 50%  Final test: 50% |
| Reading list | 1. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, Intermediate: student's book. Harlow: Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, Intermediate: workbook. Harlow: Pearson Education. 3. Materials prepared by the lecturer (2012). Collins Skills for the TOEIC test: Speaking and Writing. Harper Collins UK. |

### Calculus 1B - MTH00003

|  |  |
| --- | --- |
| Module designation | Calculus 1B |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | MSc. Nguyen Vu Huy |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, discussion |
| Workload (incl. contact hours, self-study hours) | Total: 90 hours.  Contact hours: 45 hours (in class).  Private study: 45 hours (self-study). |
| Credit points | 3 Credits (4.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | The course covers the differentiation and the integral of functions of one variable; the infinite sequences and series; their applications in the other sciences.  Students who complete this module could be achieved the following:   1. Knowledge: understand derivatives and integrals. 2. Competences: Ability to formulate some simple mathematical models and solve it. |
| Content | 1. Functions and Limits 2. Derivatives 3. Applications of differentiation 4. Integrals and applications of integration 5. Series |
| Examination forms | * Quizzes * Mid-term and Final exam: Written exam (closed book) |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).  Final score is greater or equal to 5.0/10.0. |
| Reading list | 1. Bộ môn Giải tích, Khoa Toán - Tin học, Giáo trình Vi tích phân 1. 2. Lecture notes. |

### Calculus 1B Practice - MTH00081

|  |  |
| --- | --- |
| Module designation | Calculus 1B Practice |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | MSc. Nguyen Vu Huy |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lab works |
| Workload (incl. contact hours, self-study hours) | Total: 65 hours.  Contact hours: 30 hours (laboratory session).  Private study: 35 hours (self-study). |
| Credit points | 1 Credits (2 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | In this course, students will apply their knowledge from the Calculus 1B course to practical computations using Matlab software. Students who complete this module could be achieved the following:   1. Knowledge: Basic knowledge of the Matlab programming language. 2. Competences: Ability to to perform calculations related to derivatives, integrals, limits, and sequences on the Matlab software. |
| Content | 1. Functions and Limits 2. Derivatives 3. Applications of differentiation 4. Integrals and applications of integration 5. Series |
| Examination forms | * Lab exercises. * Mid-term and Final exam: Coding exam. |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).  Final score is greater or equal to 5.0/10.0. |
| Reading list | 1. Bộ môn Giải tích, Khoa Toán-Tin học, Giáo trình Vi tích phân 1. 2. Lecture slides. |

### Calculus 2B - MTH00004

|  |  |
| --- | --- |
| Module designation | Calculus 2B |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Nguyen Vu Huy |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, discussion |
| Workload (incl. contact hours, self-study hours) | Total: 90 hours.  Contact hours: 45 hours (in class).  Private study: 45 hours (self-study). |
| Credit points | 3 Credits (4.5 ETCS) |
| Required and recommended prerequisites for joining the module | Calculus 1B |
| Module objectives/intended learning outcomes | The course covers the differentiation and the integral of multivariable functions; the ordinary differential equations; their applications in the other sciences. Students who complete this module could be achieved the following:   1. Knowledge: understand partial derivatives and multiple integrals with their applications; Some models with ordinary differential equations. 2. Competences: Ability to formulate some simple mathematical models and solve them; Ability to solve some ordinary differential equations of 1st and 2nd order. |
| Content | 1. Partial derivatives 2. Multiple integrals 3. Vector calculus 4. Differential equations |
| Examination forms | * Quizzes * Mid-term and Final exam: Written exam (closed book) |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. Bộ môn Giải tích, Khoa Toán - Tin học, Giáo trình Vi tích phân 2. 2. Lecture notes. |

### Calculus 2B Practice - MTH00082

|  |  |
| --- | --- |
| Module designation | Calculus 2B Practice |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Nguyen Vu Huy |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lab works |
| Workload (incl. contact hours, self-study hours) | Total: 65 hours.  Contact hours: 30 hours (laboratory session).  Private study: 35 hours (self-study). |
| Credit points | 1 Credits (2 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | In this course, students are guided to solve exercises on differential calculus and integral calculus of multivariable functions, to understand and apply these concepts. Students who complete this module could be achieved the following:   1. Knowledge: Students practice calculations to understand and apply definitions, theorems, and properties in calculus. Students know how to use computational software to perform differential and integral calculus of multivariable functions. 2. Skill: Understand and solve calculus exercises applied in practical problems, solve calculus problems, and know how to use computational software. 3. Attitude, Diligence: Students need to attend all classes, can ask questions about unclear issues, and answer the instructor's questions on exercises. |
| Content | 1. Rn space, partial derivatives 2. Multiple integrals 3. Line integrals, Surface integrals 4. The order differential equations |
| Examination forms | * Lab exercises. * Mid-term and Final exam: Coding exam. |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).  Final score is greater or equal to 5.0/10.0. |
| Reading list | * + - 1. Bộ môn Giải tích, Khoa Toán - Tin học, Giáo trình Vi tích phân 2.       2. Lecture notes. |

### Linear Algebra - MTH00030

|  |  |
| --- | --- |
| Module designation | Linear Algebra |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | Dr. Le Van Luyen,  Dr. Bui Anh Tuan |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 135 hours  Contact hours: lectures 45 hour (in class)  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (4.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objectives: To be familiar with advanced mathematics.  Specific objectives/course learning outcomes:   1. Knowledge: Mastering the knowledge of matrices on number fields and applying them to solving systems of linear equations; determinants and their applications; vector spaces and linear transformations. 2. Skills: Calculating on matrices; solving system of linear equations; calculating the coordinates of the vector according to a basis in a finite dimensional vector space; changing when changing the base; representing a linear operator by a matrix; finding the image and the kernel of linear operators; using MAPLE software. 3. Attitude: Attend all classroom sessions; discussions outside of class time. |
| Content | This course is taught in the first semester, initially introducing students to advanced mathematics. Beside equipping new knowledge that is necessary for freshman, this course also provides the foundation knowledge to help students carry out specialized courses. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Midterm: 40%  Final: 60% |
| Reading list | 1. Đại số tuyến tính và ứng dụng, Tập 1, Bùi Xuân Hải, Trần Ngọc Hội, Trịnh Thanh Đèo, Lê Văn Luyện. 2. Giáo trình Đại số tuyến tính, Ngô Việt Trung. |

### Linear Algebra Practice - MTH00083

|  |  |
| --- | --- |
| Module designation | Linear Algebra Practice |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Pham The Nhan |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 60 hours  Contact hours: 30 lab hours (in class)  Private study: 30 hours (self-study) |
| Credit points | 1 Credits (2 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objectives: To help students understand more linear algebra via doing exercise.  Specific objectives/course learning outcomes:   1. Knowledge: Mastering the knowledge of matrices on numerical fields and applying them to solving systems of linear equations; determinants and their applications; vector spaces and linear transformations. 2. Skills: Calculating on matrices; solving system of linear equations; calculating the coordinates of the vector according to a basis in a finite dimensional vector space; changing when changing the base; representing a linear operator by a matrix; finding the image and the kernel of linear operators; using MAPLE software. 3. Attitude: Attend all classroom sessions; discussions outside of class time. |
| Content | This course is taught in the first year, initially introducing students to advanced mathematics. Beside equipping new knowledge that is necessary for freshman, this course also provides the foundation knowledge to help students carry out specialized courses. |
| Examination forms | Tests - process score: 30%  Midterm exam: 30%  Final exam: 40% |
| Study and examination requirements | Midterm and final exam: written exams. |
| Reading list | 1. Đại số tuyến tính và ứng dụng, Tập 1, Bùi Xuân Hải, Trần Ngọc Hội, Trịnh Thanh Đèo, Lê Văn Luyện. 2. Giáo trình Đại số tuyến tính, Ngô Việt Trung Phạm Huy Điển, Tính toán, lập trình và giảng dạy toán học trên Maple, 2009 |

### Probability and Statistics - MTH00040

|  |  |
| --- | --- |
| Module designation | Probability and Statistics |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Dr. Hoang Van Ha,  Dr. Nguyen Thi Mong Ngoc |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | 135 Hours  Contact hours: Lectures: 45 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (4.5 ECTS) |
| Required and recommended prerequisites for joining the module | Recommended prerequisites: Calculus 1B. |
| Module objectives/intended learning outcomes | This course provides fundamental knowledge on theory of probability and statistics. Probability is the science studying phenomenon with random effects, and techniques in statistics help to analyze data to construct appropriate statistical models and make statistical inferences.   1. Knowledge: get familiar with basic concepts in theory of probability and statistics, supporting future advance courses. 2. Skills & competences: cognitive and practical abilities to use these knowledges in presenting and analyzing data. |
| Content | This module includes the following topics:   * + - 1. Basic concepts in probability theory.       2. Random variables and probability distributions.       3. Descriptive Statistics.       4. Point estimation of parameters and confident interval.       5. Statistical hypothesis testing.       6. Simple linear regression. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | Main textbook: Nguyễn Thị Mộng Ngọc (chủ biên), Giáo trình bài tập Xác suất Thống kê, NXB ĐHQG TP.HCM, 2022.  References:   1. Đặng Đức Trọng (chủ biên), Lý thuyết thống kê,  NXB ĐHQG TP.HCM, 2016. 2. Đinh Ngọc Thanh (chủ biên), Bài tập và thực hành  Lý thuyết thống kê, Nxb ĐHQG TP.HCM, 2016. 3. Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for engineers, Wiley, 7 ed., 2018. |

### Probability and Statistics Practice - MTH00085

|  |  |
| --- | --- |
| Module designation | Probability and Statistics Practice |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Dr. Hoang Van Ha |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lab work |
| Workload (incl. contact hours, self-study hours) | 60 Hours  Contact hours: Lectures: 15 hours (in class)  Private study: 45 hours (self-study) |
| Credit points | 1 Credits (2 ECTS) |
| Required and recommended prerequisites for joining the module | Recommended prerequisites: Calculus 1B |
| Module objectives/intended learning outcomes | This course provides fundamental knowledge on practical sessions using the statistical software R for theoretical lessons of the course “Mathematical Statistics” including Descriptive Statistics; parameters estimation (point estimations and interval estimations); statistical hypothesis testing and simple linear regression. |
| Content | This module includes the following topics:   * + - 1. An introduction to the statistical software R.       2. Lab sessions on descriptive statistics.       3. Lab sessions on sample distributions.       4. Lab sessions on parameter estimations.       5. Lab sessions on statistical hypothesis testing.       6. Lab sessions on simple linear regression. |
| Examination forms | Midterm and final exam: coding exams. |
| Study and examination requirements | Class-attendance: at least 80%.  Overall grade: minimum 5.0/10.0. |
| Reading list | Main textbook: Đinh Ngọc Thanh (chủ biên), Bài tập và thực hành Lý thuyết thống kê, Nxb ĐHQG TP.HCM, 2016.  References:   1. Đặng Đức Trọng (chủ biên), Lý thuyết thống kê, NXB ĐHQG TP.HCM, 2016. 2. Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for engineers, Wiley, 7 ed., 2018. |

### Discrete Mathematics - MTH00041

|  |  |
| --- | --- |
| Module designation | Discrete Mathematics |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Dr. Bui Anh Tuan |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 135 Hours  Contact hours: Lectures: 45 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (4.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objective: To introduce the students to the fundamentals of logic, counting principles, integers, relations, recurrence relations, and Boolean functions.  Specific objectives/course learning outcomes:   1. Knowledge: Master the fundamental knowledge of the structure of discrete mathematics and their applications. 2. Skills: Assist students in developing the skills of inference and proof of mathematical theorems thoroughly and rigorously. 3. Attitude: Attend at least 50% of the class time for theory sessions. Complete at least 50% of the assigned exercises. |
| Content | This module includes the following topics:   |  |  | | --- | --- | | 1. The foundations of logic 2. Sets and functions 3. Counting 4. Integers 5. Induction and recursion 6. Relations 7. Boolean algebra |  | |
| Examination forms | * Class discussion; * Quizzes * Mid-term and Final exam: Written exam (closed book) |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main book:   * + - 1. Nguyen Huu Anh, Discrete Mathematics, The Education Publishing House, 2003       2. K. H. Rosen, Discrete Mathematics and Its Applications, 8th ed., McGraw Hill, 2019.   References:  Stein, Drysdale and Bogart, Discrete Mathematics for Computer Scientists, Addison-Wesley, 2010. |

### Discrete Mathematics Practice - MTH00086

|  |  |
| --- | --- |
| Module designation | Discrete Mathematics Practice |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Dr. Le Van Luyen |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours: Lectures: 30 hours (in class)  Private study: 60 hours (self-study) |
| Credit points | 1 Credits (1.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objective: Help students master the problems of Discrete Mathematics through guidance on solving exercises. Use computer tools and programming languages ​​to find solutions and solve problems in discrete mathematics.  Specific objectives/course learning outcomes:   1. Knowledge: Master the fundamental knowledge of the structure of discrete mathematics and their applications. 2. Skills: Assist students in developing the skills of inference and proof of mathematical theorems thoroughly and rigorously. 3. Attitude: Attend at least 50% of the class time for theory sessions. Complete at least 50% of the assigned exercises. |
| Content | This module includes the following topics:   1. The foundations of logic 2. Sets and functions 3. Counting 4. Integers 5. Induction and recursion 6. Relations 7. Boolean algebra |
| Examination forms | * Class discussion; * Quizzes; * Mid-term and Final exam: Written exam (closed book). |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main book:   * + - 1. Nguyen Huu Anh, Discrete Mathematics, The Education Publishing House, 2003       2. K. H. Rosen, Discrete Mathematics and Its Applications, 8th ed., McGraw Hill, 2019.   References: Stein, Drysdale and Bogart, Discrete Mathematics for Computer Scientists, Addison-Wesley, 2010. |

### Combinatorics - MTH00050

|  |  |
| --- | --- |
| Module designation | Combinatorics |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | Dr. Le Van Luyen |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: lectures 45 hours + 30 exercise hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objective: provide students with knowledge of graph theory and mathematical combinatorics. In the graph theory section, students will be introduced to basic concepts such as graphs, paths, cycles, trees and algorithms for finding the shortest-spanning tree, the shortest path. In the mathematical combinatorics section, students learn advanced counting techniques such as generating functions, the inclusion-exclusion principle and rook polynomials. In addition, the subject also introduces some advanced counting such as Catalan, Stirling and Bell numbers.  Specific objectives/course learning outcomes:   1. Knowledge: Master the fundamental knowledge of the structure of graph theory, combinatorics and their applications. 2. Skills: Assist students in developing the skills of inference and proof of mathematical theorems thoroughly and rigorously. 3. Attitude: Attend at least 50% of the class time for theory sessions. Complete at least 50% of the assigned exercises. |
| Content | This module includes the following topics:   1. Elements of graph theory 2. Trees 3. Path problems 4. Generating functions 5. Principle of inclusion and exclusion 6. Advanced counting numbers |
| Examination forms | * Class discussion; * Assignments; * Quizzes; * Mid-term and Final exam: Written exam (closed book). |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Assignments: 20%, Midterm Exam: 30%, Final Exam: 50%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main book:   * + - 1. Alan Tucker, Applied Combinatorics 6th edition, JohnWiley & Sons, Inc.       2. Trần Ngọc Danh, Toán rời rạc nâng cao, NXB ĐHQG-TPHCM, 2001.   References:   1. Walter D. Wallis, John C. George, Introduction To Combinatorics, 2nd Edition, Crc Press , 2018. 2. 2. K. Rosen, McGraw-Hill, Discrete Mathematics and its Applications, 7th Edition, 2011. |

### Fundamentals of Computer Programming - MTH00055

|  |  |
| --- | --- |
| Module designation | Fundamentals Computer Programming |
| Semester(s) in which the module is taught | 1st semester |
| Person responsible for the module | MSc. Nguyen Hien Luong  MSc. Ha Van Thao |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, group work, small group solving exercises |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: lectures 45 hours + 30 lab hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (4.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Introduce to students the basic knowledge and principles of computer programming and the C/C++ programming language |
| Content | 1. Basic concepts of algorithms. 2. Describe the skills and fundamentals of computer programming. 3. Introduction to the C programming language. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Brian W. Kernighan, Dennis. M. Ritchie (1988), The C Programming Language 2nd, Prentice Hall PTR. 2. Robert Sedgewick (1994), Algorithms, Addison Wesley. 3. Donald E. Knuth (1997), The Art of Computer Programming - Vol 2 3rd, Addison Wesley. |

### Computational Software Laboratory - MTH00087

|  |  |
| --- | --- |
| Module designation | Computational Software Laboratory |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | Dr. Ong Thanh Hai |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | lectures, computer practices |
| Workload (incl. contact hours, self-study hours) | 120 hours  Contact hours: 60 lab hours (in class)  Private study: 60 hours (self-study) |
| Credit points | 2 Credits (4 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Students can use computational programming languages to program calculations in mechanics, analysis, numerical analysis, algebra, statistics… |
| Content | The course covers basic computational programming knowledge using Matlab... Applying this knowledge to write programs to solve problems in mechanics, analysis, numerical analysis, algebra, … |
| Examination forms | Tests - process score: 30%  Midterm exam: 30%  Final exam: 40% |
| Study and examination requirements | Midterm and final exam: practical exercises in laboratory.  Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | 1. Essential MATLAB ® for Engineers and Scientists, 3rd edition, Elsevier Brian D. Hahn and Daniel T. Valentine, 2007. 2. Numerical methods using Matlab. Third Edition. Prentice Hall J. H. Mathews, K. D. Frink, 1999. |

### Introduction to Information Technology - CSC00004

|  |  |
| --- | --- |
| Module designation | Introduction to Information Technology |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | Lecturers at Center of Informatics, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, problem, lab work |
| Workload (incl. contact hours, self-study hours) | Total workload: 165 hours  Contact hours: Lectures: 45 hours (in class) and lab work 30 hours  Private study: 90 hours (self-study) |
| Credit points | 4 credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to implement and present various topics related to career orientation in teamwork, demonstrating critical and creative thinking; they will understand the meaning, role, and status of hardware and software, explain data storage systems and databases, identify the function of operating systems and their development processes, grasp basic concepts of computer networks and security issues, summarize key characteristics of artificial intelligence and emerging technologies, and recognize essential rules and regulations in university and company environments while understanding professional ethics. |
| Content | 1. Introduce an overview of the development process, the role of IT in life. Learn about computer classification, the basic architecture of a computer. Introduce the characteristics and role of software in the computer. 2. Introduce primary hardware devices such as ports and circuits to peripheral devices such as RAM, hard drives, etc... in computers. Identify each device's characteristics, roles, and meanings and how they work together. 3. Principle of storing information in computers such as number (integer and floating point), text, images, sounds, ... Basic operations on the counting system. 4. How the CPU executes a low-level program. How the CPU works with other devices to make a request. The relationship between low-level languages and high-level programming languages. 5. Operating system (OS): characteristics, roles, and development process on all computer platforms. The basic architecture and components of the operating system. 6. Computer network: transmission principles, connection protocols, network types, security. Supported devices and software. Computer security such as how to attack and how to protect the computer. 7. Database system: roles, meanings, applications. Database management systems. 8. Introduction to artificial intelligence, machine earning, and applications. 9. Software engineering: The Software Engineering Discipline, The Software Life Cycle, Development Phases, Software Engineering Methodologies, Documentation, Project Management. 10. Professional ethics such as copyright laws, privacy and legal documents related to IT. Rules and regulations in university and company. 11. Introduction to IT certificates |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | 1. Assignments at Class 2. Homework 3. Midterm Exam 4. Practice 5. Final exam |
| Reading list | 1. Computer science: reflection on the field, reflections from the field, Committee on the Fundamentals of Computer Science, National Academies Press, 2004. 2. Computer science: an overview, Gleen Brookshear, Dennis Brylow, 12th edition, 2014. 3. Computers are your future, Introductory, Catherine Laberta, 12th Edition, 2011. 4. Ethics for the Information Age, Mike Quinn, 7th Edition, 2016. |

### General Environment - ENV00001

|  |  |
| --- | --- |
| Module designation | General Environment |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | Lecturers at Faculty of Environment, University of Science , VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | 90 hours  Contact hours: lectures 30 hour (in class)  Private study: 60 hours (self-study) |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the  module | None |
| Module objectives/intended learning outcomes | This is a compulsory subject in the general knowledge block in the training program for students of all disciplines. The focus of this module is to provide basic knowledge of Environmental Science: concepts, classification of resources, environment, basic problems and core of the environment. Students are also introduced to measures to protect the environment, conserve resources towards the goal of sustainable development. |
| Content | Chapter 1: Overview of the Environment  General concepts of environment  Basic composition of the environment (volumes)  Chapter 3: Natural Resources  Definition  Classification  General issues of natural disaster  Chapter 4: Human Impact on the environment  History of human impact on the environment  Human impact on environmental components  Chapter 5: Environmental issues and sustainable development  5.1 Population and environment  5.2 Environmental pollution  5.3 Climate change  5.4 Sustainable development  Chapter 6: Environmental management and Environmental Education |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Midterm test: 30% Final test: 70% |
| Reading list | Textbooks:   * + - 1. Lecture on General Environment, compiled by the group of teachers.       2. Le Van Khoa (Editor), 2004. Environmental science, Education Publishing House.   References   1. Le Van Khoa, Doan Van Canh, Nguyen Quang Hung, Lam Minh Triet (2011). Textbook of People and the Environment, Education Publishing House. 2. Goudie, A. (2006) The Human Impact on Natural 3. Environment. 6th Edition. Oxford. Blackwell 4. Le Thi Thanh Mai (2008), Textbook of People and the Environment. National University of Ho Chi Minh City. |

### Human and Environment - ENV00003

|  |  |
| --- | --- |
| Module designation | Human and Environment |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Le Cong Man (Faculty of Biology and Biotechnology, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, disscusion |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 30  Contact hours (please specify whether lecture, exercise, laboratory session, etc.):  - Lecture hours: 30  - Practical hours: 0  - Exercise hours: 0  - Extra-contact hours per week:  Private study including examination preparation, specified in hours:  hours |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the module | Required prerequisites: General Biology  Recommended prerequisites: 0 |
| Module objectives/intended learning outcomes | Providing students with knowledge about humans' relationship with nature, including inanimate factors and other living things around humans  Knowledge: knowing the position, tasks, and roles of humans in the ecosystem.  Skills: recognizing results from human activities and impacts on natural and social life.  Attitude, Diligence  Able to practice soft skills (teamwork, presentations) |
| Content | Part 1: The formation of human community and society  Chapter 1: Introduction  Chapter 2: Ecological factors  Chapter 3: Population - biome - ecosystem  Chapter 4: People and the environment  Chapter 5: History of human impact on the environment  Part 2: Needs and products in human society  Chapter 6: Essential human needs  Chapter 7: Resources  Chapter 8: Pollution  Chapter 9: Environmental protection and sustainable development  Chapter 10: Cultural and legal issues.  Part 3: Observe and identify (from an ecological point of view) ongoing phenomena affecting the lives of humans and other living things |
| Examination forms | Mini-projects |
| Study and examination requirements | Study Requirements: 0  Examination Requirements:   1. Discuss 2. Teamwork 3. Seminar 4. Learning attitude 5. Final exam |
| Reading list | 1. Phạm Xuân Hậu (1997). Con người và môi trường. NXB Giáo dục. 2. Lê Văn Khoa (chủ biên) (2002). Khoa học môi trường. NXB Giáo dục. 3. Nguyễn Hữu Nhân, Hoàng Quý Tình (2011). Sinh thái học người. NXB Giáo dục. |

### Earth Science - GEO00002

|  |  |
| --- | --- |
| Module designation | Earth science |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | Lecturers at Faculty of Geology, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | Total: 60 hours.  Contact hours: 30 lectures hours (in class)  Private study: 30 hours (self-study) |
| Credit points | 2 credits (3 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Earth Science introduces general knowledge about the Earth related to the rights of the Earth, inside and outside the Earth including position and operation of the earth in space; composition and structure of the atmosphere, wind, and weather, climate, climate change; distribution of freshwater in hydrosphere, sea and ocean behaviour, El Nino-La Nina phenomena: Geosphere: composition and structure of the earth's crust, weathering, erosion-accumulation, landslides, the internal structure of the earth, earthquakes, volcanoes, plate tectonic activities; learn about the history of the earth through the record of fossil remains. Knowledge of Earth science is a necessary basis for understanding the natural environment of the Earth. |
| Content | 1. Presentation on deformations of the earth's crust and earthquake, volcanic activities and membrane tectonic mechanism 2. Learn about Earth's history through fossil and stratigraphic records. 3. Apply this knowledge to explain some issues in the main profession 4. Skilled in group discussion, presentation and criticism Attitude, diligence: enthusiasm, honesty in learning; Serious and honest in checking. |
| Examination forms | Writing (Midterm: 30%, Final exam: 70%) |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | * + - 1. Earth Science, DANIELSON, E.W., DENECKE. EJ. Ir. 1986.       2. Foundations of Earth Science, Lutgens Frederick K. Tarbuck Edward, 1, 1997.       3. Earth Science Textbook, LUU DUC HAI, TRAN NGHI. 2008. |

### General Chemistry 1 - CHE00001

|  |  |
| --- | --- |
| Module designation | General Chemistry 1 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Chemistry, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 150 Hours  Contact hours: Lectures: 30 hours (in class) Exercise: 30 hours  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | This subject is the first Chemistry subject for students of Chemistry and Materials Science. The subject deals with the theoretical foundations of Chemistry related to the basic models of the atomic structure, the periodic changes in the properties of chemical elements, the fundamental forces of interaction in the matter, and the influence of chemical elements. their influence on the properties of matter in the solid, liquid, and gaseous states. |
| Content | 1. Describe the structure of atoms and molecules. 2. Explain periodic changes in some properties of chemical elements. 3. Identify and distinguish basic types of chemical bonds. 4. Identify and explain the relationship between the fundamental forces of interaction in matter and the physical properties of matter. |
| Examination forms | Written exam  Midterm test: 30%  Final test: 70% |
| Study and examination requirements | Minimum attendance at lectures is 80% Final score is greater or equal to 5.0/10.0 |
| Reading list | Textbooks:   1. Nguyen Dinh Chi (2007). General chemistry. Hanoi Education Publishing House 2. Nguyen Dinh Soa (2000). General chemistry. Ho Chi Minh City National University Publishing House 3. Petrucci, R.H; Harwood, W.S; Herring, F.G (2002, 8th Ed.). General Chemistry. USA: Prentice Hall   Others:  Le Thi So Nhu. Summary of General Chemistry lecture - internal documents (For internal circulation only) |

### General Chemistry 2 - CHE00002

|  |  |
| --- | --- |
| Module designation | General Chemistry 2 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Chemistry, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 150 Hours  Contact hours: Lectures: 30 hours (in class) Exercise: 30 hours  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Introduce students to the facts, concepts, and vocabulary of chemistry that will enable them to make informed decisions on issues that involve chemical concepts. Give opportunity to use the scientific method to formulate explanations for events in the natural world. Explore the role of measurement in the development of these explanations and the use of logic to test the validity of claims. Show relationships of chemistry to other disciplines, such as mathematics and the biological sciences. Demonstrate the application of chemistry concepts in the everyday world. Give opportunity to apply learned concepts in new situations of both practical and theoretical significance. Give opportunity to read selected scientific materials and apply appropriate language to describe and analyze scientific events. Develop students scientific problem-solving skills through sequential, mathematically oriented assignments. |
| Content | The contents are chemical thermodynamics, chemical kinetics, general chemical equilibria, acid and base equilibria, pH, buffers, ionic compound solubility and equilibria electrochemistry. |
| Examination forms | Written exam  Midterm test: 35%  Quiz or Assignment: 15%  Final test: 50% |
| Study and examination requirements | Minimum attendance at lectures is 80% Final score is greater or equal to 5.0/10.0 |
| Reading list | Ralph H. Petrucci, F. G. Herring, J. Madura, C. Bissonnette (2011), General Chemistry, Principles and Modern Applications, Pearson Canada, 10nd Edition. |

### General Chemistry Laboratory 1 - CHE00081

|  |  |
| --- | --- |
| Module designation | General Chemistry Laboratory 1 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Chemistry, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours: Exercise: 60 hours  Private study: 30 hours (self-study) |
| Credit points | 2 Credits (4 ECTS) |
| Required and recommended prerequisites for joining the module | General Chemistry 1 |
| Module objectives/intended learning outcomes | 1. Describe the chemical processes of experiments 2. Use the equipment in chemistry lab correctly 3. Calculate, write chemistry laboratory report correctly 4. Work in lab safely, scientifically |
| Content | The objective of the general chemistry laboratory course is to become proficient in techniques used by practicing chemist, to use and handle safely and properly laboratory glassware, to carry out experiments safely and carefully in the laboratory, to obtain data accurately and to manipulate the data correctly. This course also complements and consolidates the theoretical knowledge acquired in the general chemistry lecture course. In as much as this course is only a supplement to general chemistry lecture courses, students must have had the general chemistry lecture. |
| Examination forms | Written exam  Midterm test: 20%  Experimental Reports: 60%  Final test: 20% |
| Study and examination requirements | Minimum lab hours: 7/9  If score of the final exam ≤ 3, the final score will be (midterm test) \*20% + (Average of Experimental Reports)\*30% + (Final exam)\*20%. |
| Reading list | Textbooks:   1. General Chemistry Laboratory 1, Hoàng Ngọc Cường (2023) 2. General Chemistry Laboratory 1-Prelab-Report, Hoàng Ngọc Cường (2023) |

### General Chemistry Laboratory 2 - CHE00082

|  |  |
| --- | --- |
| Module designation | General Chemistry Laboratory 2 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Chemistry, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Do lecturing, teamwork, divide students into groups to solve problems |
| Workload (incl. contact hours, self-study hours) | 90 Hours  Contact hours: Exercise: 60 hours  Private study: 30 hours (self-study) |
| Credit points | 2 Credits (4 ECTS) |
| Required and recommended prerequisites for joining the module | General Chemistry 2 |
| Module objectives/intended learning outcomes | 1. Describe the chemical processes of experiments 2. Use the equipment in chemistry lab correctly 3. Calculate, write chemistry laboratory report correctly 4. Work in lab safely, scientifically |
| Content | General Chemistry Laboratory 2 is an introductory course to general chemistry laboratory. The overall goal of this course is to introduce general chemistry focused on understanding the concepts within the labs and the scientific method. These concepts include but are not limited to: understanding basic operation in a chemistry laboratory, components of matter, stoichiometry, determination of concentration by titration, weight measuring, preparation and properties of inorganic and organic substances. |
| Examination forms | Written exam Midterm test: 20% + Experimental Reports: 60% + Final test: 20% |
| Study and examination requirements | Minimum lab hours: 7/9  If score of the final exam ≤ 3, the final score will be (midterm test) \*20% + (Average of Experimental Reports) \*30% + (Final exam) \*20%. |
| Reading list | Textbooks:  Hoang Ngoc Cuong, General Chemistry Laboratory 2 Manual |

### General Biology I - BIO00001

|  |  |
| --- | --- |
| Module designation | General Biology 1 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Biology and Biotechnology, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | This course introduces the topic, gives questions, asks students to see the clip, discusses and reviews |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 135  Contact hours (please specify whether lecture, exercise, laboratory session, etc.):  - Lecture hours: 45  - Practical hours: 0  - Exercise hours: 0  - Extra-contact hours per week: 0  Private study including examination preparation, specified in hours: 90 hours |
| Credit points | 3 Credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | 1. Know the fundamental concepts of biology and the scientific process; distinguish observation, hypothesis, test, and theory 2. Explain the chemical composition of living matter, and chemical reaction related to biology 3. Describe the structure and properties of water, structure and function of large biology molecules 4. Distinguish the structure and function of cells, membranes and cellular organelles 5. Describe metabolism at the cellular level, including enzyme activity, cellular respiration, and photosynthesis. 6. Describe DNA structure and function, including replication and repair, transcription, and translation. 7. Describe the mechanism of genetic: cell division, fertilization, mutation, and genetic variation. 8. Explain Biotechnology 9. Explain the evolution and biodiversity 10. Describe the concepts and mechanisms of the origin of species |
| Content | Introduction to Biology:  The fundamental concepts in biology  The scientific methods to study the life  Part 1. The chemical of life  Part 2. The Cell  Part 3. Genetics  Part 4. Mechanisms of Evolution  Conclusion |
| Examination forms | Multiple choice test |
| Study and examination requirements | Students create groups: listen, write, and give questions, answers.  6 Quizzes - Midterm examination - Final examination |
| Reading list | Textbooks   1. Bui Trang Viet (2012). Cell Biology. VNU-HCM. 2. Pham Thanh Ho (2011). Biology: Cell, genetic and evolution. VNU-HCM.   Supplementary reading   1. Reece J. B., Urry, L. A., Cain M. L. 1., Wasserman S. A., Minorsky P. V., Jackson R.B., & Campbell N. A. (2014). Campbell biology (1st edition), Pearson. 2. Lecture slides and related clips. |

### General Biology II - BIO00002

|  |  |
| --- | --- |
| Module designation | General Biology 2 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Faculty of Biology and Biotechnology, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecturing, posing questions for discussions, presenting videos, giving homework |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 135  Contact hours (please specify whether lecture, exercise, laboratory session, etc.):  - Lecture hours: 45  - Practical hours: 0  - Exercise hours: 0  - Extra-contact hours per week: 0  Private study including examination preparation, specified in hours: 90 hours |
| Credit points | 3 Credits (4.5 ECTS) |
| Required and recommended prerequisites for joining the module | Required prerequisites:  Recommended prerequisites: General Biology I |
| Module objectives/intended learning outcomes | PART 1. PLANT MORPHOLOGY AND FUNCTION  Learners get to know about plant morphology, functions, and their ecological relationships. They explore nutrient absorption, material transport in vascular plants, and the vital role of soils in providing nutrients. Additionally, they examine plant life cycles, reproductive systems, and how plants respond to environmental cues for survival.  PART 2. ANIMAL MORPHOLOGY AND FUNCTION  Learners explore the correlation between animal anatomy and physiology. They delve into the structure and functions of key systems including digestion, circulation, respiration, immunity, endocrinology, reproduction, and the nervous system. Additionally, they study osmoregulation, excretion processes, and the mechanisms underlying animal sensation and movement.  PART 3. ECOLOGY  Learners explore ecological factors and their impacts on organisms, studying adaptation strategies. They learn about ecosystem components, structural dynamics, functional processes, material and energy cycling, and equilibrium within ecosystems. Concepts of population dynamics, community interactions, and biosphere principles are also covered, along with the significance of biodiversity conservation for sustaining ecosystems locally in Vietnam and globally. |
| Content | Part 1. Plant Morphology and Function  Part 2. Animal Form and Function  Part 3. Ecology |
| Examination forms | Multiple choice test |
| Study and examination requirements | None |
| Reading list | Textbooks in English   1. Begon M., J.L. Harper, and C.R. Townsend (1986). Ecology: Individuals, Populations and Communities, Blackwell Scientific Publications. 2. Brooker, R.J, Widmaier E.P; Graham L.E and Stiling P.D. (214). Biology, McGraw-Hill. 3. Campbell N.A, J.B. Reece, L.A. Urry, M.I. Cain, S.A. Wasserman, P.V. Minorsky, and R. B. Jackson (214). Biology (1st Edition), Pearson, Benjamin Cummings. 4. Stiling P. D. (22). Ecology: Theories and Applications (Fourth Edition), Prentice-Hall, Inc. 5. Smith A.M; Coupland G; Dolan L; Harberd N; Jones J; Martin C; Sablowski R; and Amey A. (21). Plant biology, Garland Science.   Textbooks in Vietnamese   1. Nguyễn Đình Giậu (1997). Sinh học Đại cương, Tủ sách ĐH. KHTN. 2. Dương Hữu Thời (1998). Cơ sở Sinh Thái Học, Nhà xuất bản Đại học Quốc Gia Hà Nội. 3. Hoàng Kim Ngũ, Phùng Ngọc Lan (1998). Sinh Thái Rừng, Nhà xuất bản Nông Nghiệp. 4. Lê Văn Khoa, Nguyễn Văn Cự, Lê Đức, Lưu Đức Hải, Thân Đức Hiền, Trần Khắc Hiệp, Nguyễn Đình Hòe, Phạm Ngọc Hồ, Trịnh Thị Thanh (21). Khoa Học Môi Trường, Nhà xuất bản Giáo dục Việt Nam. 5. Trần Kiên, Hoàng Đức Nhuận, Mai Sỹ Tuấn (22). Sinh Thái Học và Môi trường, Nhà xuất bản Giáo Dục.   Other sources:  We bsite E-learning KhanViet - ĐH Khoa học Tự Nhiên Thành phố Hồ Chí Minh. |

### Labwork on General Biology 1 - BIO00081

|  |  |
| --- | --- |
| Module designation | Labwork on General Biology 1 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Dr. Luong Thi My Ngan (Faculty of Biology and Biotechnology, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture   1. Introduce laboratory rules 2. Divide students into groups of three or two 3. Guide experimental procedure 4. Monitor and examine students doing experiments |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 30  Contact hours (please specify whether lecture, exercise, laboratory session, etc.):  - Lecture hours: 0  - Practical hours: 30  - Exercise hours: 0  - Extra-contact hours per week:  Private study including examination preparation, specified in hours: |
| Credit points | 1 Credits (2 ECTS) |
| Required and recommended prerequisites for joining the module | Required prerequisites: General Biology 1 |
| Module objectives/intended learning outcomes | 1. Prepare temporary slides to observe cell structures and living activities. 2. Use a microscope proficiently. 3. Identify organic compounds (carbohydrates, proteins, lipids, enzymes like amylase). 4. Demonstrate and measure plant respiration. 5. Classify plants (lichens, algae, bryophytes, pteridophytes, gymnosperms, monocots, dicots). 6. Classify animals into major orders. 7. Use basic lab tools (test tubes, beakers, pipettes, etc.) effectively. 8. Collaborate and assist team members to complete tasks on time. 9. Follow lab safety rules and ensure personal and team safety. |
| Content | Introduction of Syllabus  How to use a light microscope  Cell structure; Osmosis; Chemical Composition of Cells; Enzyme Activity; Respiration; Mitosis; Microbial Diversity.  Plant Diversity; Animal Diversity |
| Examination forms | Lab Activity and Lab Report  Lab exam |
| Study and examination requirements | Study Requirements:   1. Listen 2. Do experiments 3. Make lab report 4. Put tools back in right places 5. Clean up.   Examination Requirements: Experimental process & Final exam |
| Reading list | Compulsory:   1. Lab manual: Bui Trang Viet & Le Thi My Phuoc (Editors) (2016), Lab work on General Biology I (Internal circulation) 2. Class lecture (ppt file) for Lab work on General Biology I   Supplementary:  Dickey Jean (2003) Laboratory investigations for biology |

### Labwork on General Biology 2 - BIO00082

|  |  |
| --- | --- |
| Module designation | Labwork on General Biology 2 |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | MSc. Phan Ngo Hoang (Faculty of Biology and Biotechnology, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | preaching guiding, discussion |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 30  Contact hours (please specify whether lecture, exercise, laboratory session, etc.):  - Lecture hours: 0  - Practical hours: 30  - Exercise hours: 0  - Extra-contact hours per week:  Private study including examination preparation, specified in hours: |
| Credit points | 1 Credits (2 ECTS) |
| Required and recommended prerequisites for joining the module | Required prerequisites: General Biology 2 |
| Module objectives/intended learning outcomes | 1. Distinguish different plant tissues and organs. 2. Understand and classify plant pigments. 3. Demonstrate environmental impacts on photosynthesis. 4. Explore respiration and fermentation in plants. 5. Identify different animal tissues and prove bioelectricity. 6. Explain hormonal effects on blood flow. 7. Understand climatic impacts on ecosystems. 8. Describe biological reactions and processes. 9. Interpret respiration and photosynthesis. 10. Explain cellular signal transduction. 11. Distinguish plant and animal structures and evolution. 12. Conduct and analyze biological experiments and biodiversity research. |
| Content | 1. Practice theory 2. Tissue and plant organs 3. Plant pigments 4. Photosynthesis 5. Respiration and fermentation in plants 6. Water transport of tissue 7. Animal tissues 8. Mechanical and bioelectric activity 9. Circulation of blood in the vein 10. Climate factor |
| Examination forms | Abstract paper: objectives, principles and methods of practice  Practice report  Practice and question |
| Study and examination requirements | 1. Listen, take note, practising, discussing 2. Students must not absent in practice theory class (the first week) 3. Students wear blouse when entering the Lab 4. Submit practice reports at the end of the practice session 5. Students who are absent for more than 2 practice sessions will be banned from final exam. 6. Examination Requirements:    1. Homework    2. Lab work    3. Final examination |
| Reading list | Textbooks:  Bùi Trang Việt và Phan Ngô Hoang 2009. Giáo trình thực tập Sinh học đại cương II. Trường ĐH KHTN - ĐHQG-HCM  Supplementary reading:   1. Lecture notes 2. Phạm Thành Hổ 1998. Sinh học đại cương. Nhà xuất bản giáo dục |

### General Physics 1 (Mechanics - Thermodynamics) - PHY00001

|  |  |
| --- | --- |
| Module designation | General Physics 1 (Mechanics and Thermodynamics) |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Prof. Chau Van Tao (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, discussion. |
| Workload | 135 Hours  Contact hours: Lectures: 45 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (4.5 ETCS) |
| Required and recommended  prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | This course covers the principles of kinematics, dynamics, statics, work, energy, linear momentum, gravitation, and thermodynamics. Students who complete this module could be achieved the following:   1. Knowledge: Be able to understand and apply laws of mechanics to explain physical phenomena and solve problems; Be able to understand and apply mechanisms of heat transfer, equations of state, the first and the second law of thermodynamics. 2. Skills: Be able to work at individual level and group work. 3. Competences: Ability to apply mechanics and thermodynamics knowledge to analyze physical situations. 4. Attitude: Honest |
| Content | This module includes the following topics:   1. Physics and measurement 2. Kinematics of particles 3. Force and Newton's laws 4. Conservation laws in classical mechanics 5. Kinetics of rigid bodies 6. The ideal gas 7. The first law of thermodynamics 8. The second law of thermodynamics |
| Examination forms | * Class discussion; * Quizzes and projects; * Mid-term and Final exam: Written exam (closed book). |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main books:  Nguyen Nhat Khanh (2005). Mechanics and thermodynamics lectures. VNUHCM Publishing House, Vietnam.  References:   1. Nguyen Thanh Van. (2013) General Physics 1. VNUHCM Publishing House, Vietnam. 2. Raymond A. Serway, John W. Jewett, Sr, (2014). Physics for Scientists and Engineers with Modern Physics. Brooks/Cole Publishing Company, USA. 3. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson, (2010). Physics. McGrawHill Companies, Inc, USA. |

### General Physics 2 (Electromagnetic - Optics) - PHY00002

|  |  |
| --- | --- |
| Module designation | General Physics 2 (Electromagnetism - Optics) |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Assoc. Prof. Huynh Truc Phuong (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, discussion |
| Workload | 135 Hours  Contact hours: Lectures: 45 hour (in class) Private study: 90 hours (self-study) |
| Credit points | 3 Credits (4.5 ETCS) |
| Required and recommended prerequisites for joining the module | Calculus 1B, General Physics 1 |
| Module objectives/intended  learning outcomes | This module provides basic knowledge of electric and magnetic fields and thereby an understanding of the laws and phenomena of light optics. Students who complete this module could be achieved the following:   1. Knowledge: Be able to understand and apply knowledge of electromagnetism and optics in science and life. 2. Skills: Be able to work at individual level and teamwork. 3. Competences: Ability to apply electromagnetism and optics knowledge to analyze physical situations. 4. Attitude: Honesty and diligence |
| Content | This module includes the following topics:   1. Electric charge and electric field 2. Conductors in an electric field 3. Electric current and magnetic field 4. Electromagnetic induction and applications 5. The background of light optics 6. Interference of light 7. Diffraction of light 8. Polarization of light |
| Examination forms | Oral presentation  Mid-term and Final exam: Written exam (closed book) |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main books:  Nguyen Thanh Van. (2015) General Physics. VNUHCM Publishing House, Vietnam.  References:   1. Le Vu Tuan Hung (2015) Optics. VNUHCM 2. Publishing House, Vietnam. 3. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA. 4. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson (2010). Physics. Second Edition. McGrawHill, USA. |

### Labwork on General Physics - PHY00081

|  |  |
| --- | --- |
| Module designation | Labwork on General Physics |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | MSc. Huynh Thanh Nhan (Faculty of Physics and Engineering Physics, University of Science, VNU-HCM) |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lab works, discussion, practice |
| Workload (incl. contact hours, self-study hours) | 120 Hours  Contact hours: Lab works: 60 hours (in class) Private study: 60 hours (self-study) |
| Credit points | 2 Credits (4 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | This course is a practical subject in the laboratory. This course helps students understand how to measure some physical quantities, experimental errors, analyze and evaluate measurement results. Students who complete this module could be achieved the following:   1. Knowledge: Be able to describe the process, how to measure fundamental physical quantities in the laboratory. Be able to use instruments and equipment to measure experimental data of physical quantities correctly. Be able to determine (calculate) physical quantities from measured experimental data. Be able to determine the error of experimental measurement of physical quantities. 2. Skills: Be able to work in individual, group work, self-study, and problem solving. 3. Competences: Be able to analyze, process and write experimental data reports. 4. Attitude: be honest, responsible, respect for colleagues. |
| Content | In this module, Students practice 10 of the following 13 experiments:   * + - 1. Practice 1: Density of liquid and solids. The private mass of the metals       2. Practice 2: Viscosity. Viscosity is dependence of different temperature       3. Practice 3: Reversible pendulum. The Mathematical pendulum       4. Practice 4: Heat of function for ice. Determination of heat       5. Practice 5: Mechanical equivalent of heat. The heat capacity of metals       6. Practice 6: Wheatstone Bridge. Resistor is dependence of different temperature       7. Practice 7: Voltmeter and Ammeter DC. Voltmeter and Ammeter AC       8. Practice 8: AC circuit. RLC circuit       9. Practice 9: Diode characteristics       10. Practice 10: Transistor characteristics       11. Practice 11: Microscope. To measure diameter of other small object       12. Practice 12: Refraction by a prism. Dispersion and resolving power of the prisms       13. Practice 13: Polarization of light Rotatory power |
| Examination forms | Practice reports, practice exam |
| Study and examination requirements | Minimum attendance at Lab is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Dang Van Liet, Do Dinh Luyen, Nguyen Van Nghia, Tran Thi Kim Phuong, “General Physics Experiments”, University of Science, -VNUHCM, 2008 |

### Introduction to Informatics - CSC00003

|  |  |
| --- | --- |
| Module designation | Introduction to Informatics |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | Lecturers at Centre of Informatics, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, problem, lab works |
| Workload (incl. contact hours, selfstudy hours) | Total workload: 165 hrs  Contact hours: Lectures: 15 hours (in class) and lab works 60 hours  Private study: 90 hours (self-study) |
| Credit points | 3 Credits (5.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Explain common concepts and terms related to the field of computer science. 2. Perform basic operations related to the Windows operating system and common software. 3. Create documents with professional format, structure, and presentation using software. 4. Analyze and organize data in spreadsheet format, use calculation, search, and statistical functions to create formulas for data processing and presentation. 5. Create eye-catching presentations. 6. Express concepts related to the Internet, information security on the network. 7. Be aware of searching for information and legal regulations regarding copying, sharing, and posting information on the Internet. 8. Design a basic electronic information page. |
| Content | 1. Basic understanding of IT    1. Basic knowledge of computers and computer networks.    2. Access control, ensuring data security, Malware.    3. Basic legal issues in using IT. 2. Basic computer usage    1. Windows operating system    2. Windows Explorer    3. Control Panel    4. Data compression and extraction    5. Typing in Vietnamese 3. Basic Microsoft Word    1. Document composition    2. Text formatting    3. Creating tables    4. Handling graphics in documents    5. Page layout and printing 4. Basic Microsoft PowerPoint    1. Basic presentation templates    2. Creating a presentation    3. Setting up effects for the presentation 5. Basic Microsoft Excel    1. Data formatting in Excel    2. References in Excel    3. Basic Excel functions    4. Printing and creating charts 6. Internet usage    1. Basic knowledge of the Internet    2. Information searching    3. Information security 7. Web image processing    1. Resizing image frames    2. Image cropping    3. Image rotation and flipping    4. Adjusting the brightness of an image    5. Adjusting the contrast of an image    6. Designing a basic electronic information page using HTML & CSS3. |
| Examination forms | Multiple choice exam, practical exam |
| Study and examination requirements | Minimum attendance at lectures is 80% Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. Curriculum for Basic IT Applications, Advanced IT Applications. 2. Microsoft Office MOS materials, IIG Vietnam, Fahasha. 3. IC3 Spark materials, IIG Vietnam, Fahasha. |

# **2. Professional Education Knowledge**

## 2.1. Basic knowledge

### 1. Advanced Programming - MTH10107

|  |  |
| --- | --- |
| Module designation | Advanced Programming |
| Semester(s) in which the module is taught | 2nd semester |
| Person responsible for the module | MSc. Ha Van Thao |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Fundamentals of Computer Programming (MTH00055) |
| Module objectives/intended learning outcomes | The course equips students with the knowledge of analyzing and evaluating the complexity of algorithms. Also, it provides algorithms and programming techniques to solve real-world problems and improve the efficiency of algorithms. |
| Content | This module includes the following topics:   * + - 1. Dynamic memory usage and management       2. Strings and files       3. Recursive technique       4. Basic data structures in the STK library       5. Some advanced algorithms and techniques |
| Examination forms | Final exam: written exams |
| Study and examination requirements | Exercises: 20%  Mid-term exam: 30%  Final exam: 50% |
| Reading list | Trần Đan Thư, Nguyễn Thanh Phương, Đinh Bá Tiến, Trần Minh Triết, Kỹ thuật lập trình, NXB Khoa Học Kỹ thuật, 2014.  Kernighan & Ritchie, The C Programming Language, Prentice Hall, 1988.  Stephen Prata, C++ Primer Plus, SAMS, 2005. |

### 2. Object Oriented Programming - MTH10407

|  |  |
| --- | --- |
| Module designation | Object Oriented Programming |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | MSc. Nguyen Ngoc Long |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | lecture, lab work |
| Workload (incl. contact hours, self-study hours) | Total: 165 hours  Contact hours: lecture 45 hours + 30 exercise hours  Private study: 90 hours (self-study). |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Data Structures and Algorithms (MTH10405), Fundamentals of Computer Programming (MTH00055) |
| Module objectives/intended learning outcomes | Introducing to students the basic principles of object-oriented methodology and object-oriented programming techniques as a basis for building later applications. |
| Content | 1. The principles of object-oriented methodology. 2. The principles for building object classes, data identification and manipulation, establishing relations between classes, especially inheritance relation and polymorphism. 3. Design, build classes, definition operations and operations in C ++. 4. Install specific relations between layers, inheritance, polymorphism in C ++. |
| Examination forms | Midterm and final exam: written exams/major assignment |
| Study and examination requirements | * Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | * + - 1. Bjarne Stroustrup, The C++ programming language, 3rd Edition, AT&T, 1997.       2. James O. Coplien, Advanced C++ Programming Styles and Idioms, Addison-Wesley Longman, 1991.       3. Scott Robert Ladd, C++ Kỹ Thuật và Ứng Dụng, NXB Khoa Học Kỹ Thuật, 1992.       4. J Rumbaugh, M Blaha, W Premerlani, F Eddy, W Lorensen, Object-Oriented Modeling and Design, Prentice Hall, 1991. |

### 3. Data Structures and Algorithms - MTH10405

|  |  |
| --- | --- |
| Module designation | Data Structures and Algorithms |
| Semester(s) in which the module is taught | 3rd semester |
| Person responsible for the module | MSc. Ha Van Thao |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Learning materials provide full for students at first lessons including: slide lectures, seminar topics, theory, and practice exercises.  Students have to self-study, homework, practice, and seminars in groups. Students attend full lectures and practice. |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: lectures 45 hours + 30 practical lessons in laboratory.  Private study: 90 hours (self-study). |
| Credit points | 4 credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | Fundamentals of Computer Programming (MTH00055) |
| Module objectives/intended learning outcomes | Present several basic knowledges of the data structure and algorithms, how to re-perform data according to problem purposes. Two basic methods of searching and eleven arrangements algorithms are presented in the second part.  Chapter Three and Four will present the basic data structures.  Specific objectives / course learning outcomes:   1. Knowledge: Clearly understanding algorithms, search methods, arrangements, and dynamic data structures 2. Skills: analyzing algorithms, generalize data, algorithm settings 3. Attitudes, specialized: have attitudes, views, and proper perception of subjects |
| Content | 1. Introduction of algorithms, analyzing the algorithms and generalizing data. 2. Search methods and arrangement in arrays. 3. Basic dynamic data structure: single and double linked lists, binary search trees. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | * + - 1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 1997.       2. Nhập môn cấu trúc dữ liệu và thuật toán, Trần Hạnh Nhi, Dương Anh Đức, 2003.       3. Data structures and C programs, Christopher J Van Wyk, 1990. |

### 4. Introduction to Database Systems - MTH10312

|  |  |
| --- | --- |
| Module designation | Introduction to Database Systems |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | MSc. Nguyen Hien Luong |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | none |
| Module objectives/intended learning outcomes | Introduce students to basic concepts of databases; data models; database design standards and standard forms. |
| Content | 1. Basic concepts of databases. 2. Linked entity data model, relational data model. 3. Operations on the relational data model. 4. SQL query language. 5. Standard forms and normalization algorithms for databases. |
| Examination forms | Midterm and final exam: written exam |
| Study and examination requirements | Mid-term: 30%,  Final exam: 70%  Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. R. Elsmari, S. Navathe. Fundamentals of Database Systems 4th edition, Addison Wesley, 2004. 2. Nguyễn Kim Anh, Nguyên lý của các hệ cơ sở dữ liệu, NXB ĐHQG Hà Nội, 2004. |

### 5. Computer Networks - MTH10311

|  |  |
| --- | --- |
| Module designation | Computer Networks |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | Dr. Vo Duc Cam Hai |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | 150 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 75 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | 1. Basic knowledge of computer networks such as: distinguishing between different types of networks, understanding communication and data transmission bases in networks, and understanding the functions and services that operate at each layer of the OSI and TCP models. /IP. 2. Students will learn skills in using software tools to capture and analyze data at each floor. Use popular services like web, file transfer, email, domain name, firewall. Configure the router device. |
| Content | This module includes the following topics:   1. Chapter 1: Introduction to the overview of computer networks and the applications of computer networks in practice. Classify the types of computer networks and network operating systems. A brief introduction to the OSI and TCP/IP protocol stack. 2. Chapters 2, 3, 4, 5: Introduce in detail the functions and services of the application, transport, network, and data link layers. The content taught in these chapters follows top-down approaches that will make it easy for students to acquire knowledge about networks. 3. Chapter 6: Introduction to network security and basics such as encryption methods, authentication methods, understanding some types of network attacks and preventions to ensure network data integrity. |
| Examination forms | Midterm and final exam: written exams |
| Study and examination requirements | Diligence: 10%  Midterm exam: 10%  Practice: 30%  Final exam: 50%  Final score is greater or equal to 5.0/10.0 |
| Reading list | * + - 1. JF Kurose, Computer Networking, A Top-Down Approach Featuring the Internet, 3rd edition, Addison Wesley, 2004.       2. Fred Halsall, Computer Networking, and the Internet, Fifth edition, Addison Wesley, 2005       3. Nguyen Thuc Hai, Computer Networks and Open Systems, Education Publishing House, 1997.       4. Andrew S. Tanenbaum, Computer Network, 4th edition, Prentice Hall, 2003. |

### 6. Mathematical Statistics - MTH10404

|  |  |
| --- | --- |
| Module designation | Mathematical Statistics |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | Dr. Hoang Van Ha |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | lectures, exercises, practice sessions |
| Workload (incl. contact hours, self-study hours) | Total: 145 hours.  Contact hours: lectures 15 hours; 30 exercise hours + 30 practical lessons in laboratory.  Private study: 70 hours (self-study) |
| Credit points | 3 credits (5.5 ECTS) |
| Required and recommended prerequisites for joining the module | Probability and Statistics (MTH00040) |
| Module objectives/intended learning outcomes | This course provides foundations of statistical inference. Students will be able to make inferences from data, making decisions and prediction. Students can apply statistical techniques to practical problems using R or SPSS. |
| Content | Descriptive statistics. Sampling distributions.  Point estimations: definition, estimators, and estimates. Unbiasedness, efficiency, consistency. Method of moments, method of maximum likelihood, Bayes estimators. Minimum variance unbiased estimator, Cramer-Rao lower bound.  Confidence interval: CI for means, variances and proportions.  Hypothesis testing: basic concepts, null and alternative hypotheses, simple and compound hypotheses, type I and II errors, critical region, size and power of a test, p-value. Neyman - Pearson lemma. Likelihood Ratio tests. z-tests and t-tests. Goodness of fit test.  Linear Regression. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Homework exercises: 10%  Computing exercises: 20%  Mid-term: 20%; Final exam: 50%  Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | * + - 1. Casella, George, and Roger L. Berger. Statistical inference. Cengage Learning, 2021.       2. Lehmann, Erich Leo, Joseph P. Romano, and George Casella. Testing statistical hypotheses. Vol. 3. New York: Springer, 2005.       3. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010. |

### 7. Introduction to Data Science - MTH10171

|  |  |
| --- | --- |
| Module designation | Introduction to Data Science |
| Semester(s) in which the module is taught | 4th semester |
| Person responsible for the module | Dr. Tran Anh Tuan |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | 1. Knowledge:    1. Understanding of data science and data science terminology    2. Understanding the importance and types of data 2. Skill:    1. Able to analyze what type of problem a data science problem belongs to    2. Ability to think through the steps to perform a data science problem    3. Able to evaluate the process of any practical problem 3. Attitude:   Serious and careful in establishing, analyzing, and evaluating data science problems. |
| Content | This module includes the following topics:   * + - 1. Introduction to Data Science       2. Understanding Data       3. Common Terms in Data Science       4. Data Science Life Cycle       5. Common problems in Data Science |
| Examination forms | Final exam: written exams |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | [Laura Igual](https://link.springer.com/book/10.1007/978-3-319-50017-1#author-0-0) , [Santi Seguí](https://link.springer.com/book/10.1007/978-3-319-50017-1#author-0-1), Introduction to Data Science, Springer, 2017.  Chirag Shah, A Hands-On Introduction to Data Science, Cambridge University |

## 2.2. Required Courses for Specialization

### Introduction to Artificial Intelligence - MTH10318

|  |  |
| --- | --- |
| Module designation | Introduction to Artificial Intelligence |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | Assoc. Prof. Nguyen Thanh Binh |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Required:  Data structures and Algorithms (MTH10405)  Discrete Mathematics (MTH00041) |
| Module objectives/intended learning outcomes | The course provides some basic knowledge of artificial intelligence science. The main content including Problem solving methods and applications. Focus on heuristic methods. Presenting some knowledge representation methods and some knowledge processing techniques. The problem of approximate reasoning. Introduction to some knowledge systems. Introduce some other models and methods. Ontology and Agent Concepts. At the same time, the course also introduces soft computing techniques such as Fuzzy, Neural networks, genetic algorithms. |
| Content | 1. Overview of the science of AI 2. State space and the search problem 3. Knowledge demonstration 4. Introduction to machine learning and knowledge discovery 5. Introducing Ontology and Intelligent Agent 6. Introduction to Genetic Algorithms (GA) 7. Introducing Fuzzy Logic 8. Neural Network |
| Examination forms | Midterm and final exam: written exam |
| Study and examination requirements | Do theoretical and practical exercises (40%).  Final exam (60%).  Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. Artificial intelligence: problem solving methods and knowledge processing techniques, Nguyen Thanh Thuy, 1996, Education Publishing House 2. How to solve a math problem on a computer (1, 2, 3), Hoang Kiem, 2004, Education Publishing House 3. Artificial Intelligence, Dinh Manh Tuong, 2002, Science and Technology Publishing House 4. Machine Learning, Nguyen Dinh Thuc, 2002, Social Labor Publishing House 5. Evolutionary Programming, Nguyen Dinh Thuc, 2001, Education Publishing House 6. Noron network methods and applications, Nguyen Dinh Thuc, 2000, Education Publishing House 7. Fuzzy control theory, Phan Xuan Minh, Nguyen Doan Phuoc, Science and Technology Publishing House 8. Fuzzy and Applied Logic, Dang Thanh Ha, B. Bouchon Meunier, Ho Thuan, 2007, Hanoi National University Publishing House 9. Agent-oriented software engineering, Le Tan Hung, Tu Minh Phuong, Huynh Quyet Thang, 2006, Science and Technology Publishing House 10. Artificial Intelligence A Modern Approach, Stuart J. Russell, Peter Norvig, 1995, Prentice Hall |

### Data Mining - MTH10358

|  |  |
| --- | --- |
| Module designation | Data Mining |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Assoc. Prof. Nguyen Thanh Binh |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Fundamentals of Computer Programming (MTH00055) |
| Module objectives/intended learning outcomes | After successfully completing this course, students will be able to:   * + - 1. Analyze data and carry out the steps of the data mining process       2. Understand and apply data mining algorithms and tools that can be used to assist data analysts and data mining application developers       3. Explain common data mining tasks such as regression, classification, clustering, and association rule mining       4. Participate in advanced research to improve existing algorithms for each specific problem in data mining. |
| Content | This course is intended to introduce the knowledge mining process, concepts, technologies, and applications of data mining. In addition, this course also covers data preprocessing problems, data mining tasks, algorithms, and data mining tools that can be used to assist data analysts and analysts. Data mining application development. Subject-specific topics including overview of data mining, data mining problems, data preprocessing problems, data regression, data classification, clustering data mining, association rule mining, data mining application development, and advanced research topics in data mining. |
| Examination forms | Midterm and final exam: written exams |
| Study and examination requirements | Midterm: 30%  Final exam: 70%  Final score is greater or equal to 5.0/10.0 |
| Reading list | 1. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann Publishers, 2012. 2. David Hand, Heikki Mannila, Padhraic Smyth, “Principles of Data Mining”, MIT Press, 2001 3. David L. Olson, Dursun Delen, “Advanced Data Mining Techniques”, Springer-Verlag, 2008. 4. Graham J. Williams, Simeon J. Simoff, “Data Mining: Theory, Methodology, Techniques, and Applications”, Springer-Verlag, 2006. |

### Introduction to Machine Learning - MTH10353

|  |  |
| --- | --- |
| Module designation | Introduction to Machine Learning |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Huynh The Dang |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works, project |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Probability and Statistics (MTH00040)  Linear Algebra (MTH00030) |
| Module objectives/intended learning outcomes | Students will be provided with basic knowledge of Machine Learning including decision trees, artificial neural networks, genetic algorithms, statistical theory of hypothesis testing and Bayes, ... From that students can learn more deeply about machine learning models such as association classifiers, clustering, Bayesian networks, ... These are necessary knowledge to serve the scientific research work of students in the future. |
| Content | Closed and open Leontief model, direct and indirect costs  Labor theory of value, substitution theorem  Linear optimal model, producible set, efficient production, production constraints, consumption  Nonlinear optimization model, modern theory of demand, extended theory of production  Equilibrium in the market economy, budget constraints, Walras-Wald model, Arrow-Debreu-Mckenzie model  Equilibrium growth in dynamic economic model, Leontief model, Von Neumann model, equilibrium growth model |
| Examination forms | Final exam: written exam |
| Study and examination requirements | Project: 15%  Final exam: 75%. |
| Reading list | Lecture and slides provided by the lecturer.  Tom Mitchell, Machine Learning, McGraw Hill, Second Edition. |

### Python for Data Science - MTH10605

|  |  |
| --- | --- |
| Module designation | Python for Data Science |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | MSc. Ha Van Thao |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:   * Lectures: 45 hours (in class) * Practice: 30 hours (in class) * Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objective: To present basic knowledge of python programming for data science for multidimensional signal data processing in data classification or object recognition, data mining, data analysis, statistics, machine learning, ….  The main content of the program will present the basis for students to be able to program in python in data science. Then students will apply the knowledge to solve large problems.  Specific objectives/course output standards:   * + - 1. Knowledge: Master the basics of python programming       2. Skills: analyzing and applying algorithms in practice       3. Attitude, diligence: have the right attitude, opinion, and awareness about the subject |
| Content | This module includes the following topics:   1. Introduction to Python Programming 2. Control structure 3. Function 4. Data structures in Python 5. Object-oriented programming 6. Support libraries |
| Examination forms | Midterm and final exam: written exams |
| Study and examination requirements | Class-attendance: 5%  Practices and exercises: 5%  Midterm exam: 20%  Final exam: 70%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main textbook:   1. Paul Deitel & Harvey Deitel, Intro to Python for Computer Science and Data Science, Pearson. 2022. 2. Guido van Rossumand the Python development team, Python Tutorial, Odense Universitet, Institut for Matematik og Datalogi, 2018.   References:   1. Rajeev Ratan, Data Science & Deep Learning for Business, Udemy, 2022. 2. tensorflow.org, tensorflow, <https://www.tensorflow.org/tutorials>, 2019. 3. keras.io, keras, https://keras.io/, 2019. 4. Scikit-learn.org, scikit-learn, <https://scikit-learn.org/stable/tutorial/index.html>, 2019 |

## 2.3. Elective Courses for Specialization

### Multivariate Statistics - MTH10619

|  |  |
| --- | --- |
| Module designation | Multivariate Statistics |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Nguyen Thi Mong Ngoc |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, do exercises, group work, lab works |
| Workload (incl. contact hours, self-study hours) | Total: 165 hours  Contact hours: Lectures 45 hours (in class) + 30 lab works hours  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | Linear Algebra, Mathematical Statistics |
| Module objectives/intended learning outcomes | Equip students with the knowledge base of multidimensional statistical system processing. Apply multivariate skills and "hands-on" techniques using R or Python programming in analyzing the real data. |
| Content | Multivariate normal distribution, Inference about a mean vector (Hotelling’s T^2 and Likelihood Ratio Tests, Confidence regions and simultaneous comparisons of Component Means, multivariate quality Control Charts, …); comparisons of several multivariate means (Comparing Mean Vectors from two population, One-Way MANOVA, Two-Way MANOVA, Testing for Equality of Covariance Matrices), Principal Components Analysis (PCA).  Apply multivariate skills and "hands-on" techniques using R (or Python) programming in analyzing the real data. |
| Examination forms | Written exams |
| Study and examination requirements | Mid-term: 50%,  Final exam: 50%. |
| Reading list | 1. Applied Multivariate Statistical Analysis, Richard A. Johnson, Dean W. Wichern, 2007. 2. An Introduction to Multivariate Statistical Analysis, T. W. Anderson, 2003. 3. Applied Multivariate StatisticalAnalysis, Wolfgang Härdle, Léopold Sima, 2007. 4. Applied Multivariate Statistics with R, Daniel Zelterman, 2015. 5. An R and S-PLUS Companion to Multivariate Analysis, Everitt, B.S. 2005. |

### Analysis of Statistical Data - MTH10513

|  |  |
| --- | --- |
| Module designation | Analysis of Statistical Data |
| Semester(s) in which the module is taught | 5th semester |
| Person responsible for the module | Dr. To Duc Khanh |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lectures, group work |
| Workload (incl. contact hours, self-study hours) | 120 Hours  Contact hours: Lectures: 30 hours *(in class) +* 30 hourscomputer lab  Private study: 60 hours *(self-study)* |
| Credit points | 3 Credits (5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | The course provides students with a comprehensive perspective on data processing in general and statistical data analysis in particular. It equips students with the necessary skills to become data scientists, enabling them to independently complete an entire data processing cycle using statistical analysis methods with R programme.  Knowledge: Gain a solid understanding of the steps involved in a statistical data processing cycle. Distinguish between different types of data and select appropriate approaches.  Skills & competences: Through laboratory activities, the course provides the necessary tools for the data processing, using the R statistical software. By the laboratory activities and group work, the student will be able to:   1. recognize and appropriately describe the case study. 2. effectively apply various analytical methods to different types of data and organizational/business questions. 3. increase sensitivity and criticality in the use of statistical methods regarding case studies. 4. work in a group. 5. develop analytical skills and independent judgment. 6. develop communication skills. |
| Content | This module includes the following topics:  Introduction to statistical data processing.  Data and some statistical concepts.  A/B testing.  Linear regressions and Prediction.  Classification models.  Strategy for missing data and imbalanced data.  Applied survival analysis to Data science |
| Examination forms | Midterm exam: written exams.  Final exam: project. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | References:   1. Peter Bruce. & Andrew Bruce. *Practical Statistics for Data Scientists*, O'Reilly Media, Inc., 2017. 2. Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani. *An Introduction to Statistical Learning with application in R, 2nd*, Springer, 2021. 3. Alan Agresti & Maria Kateri. *Foundations of Statistics for Data Scientists*, Chapman & Hall/CRC, 2022. 4. Hadley Wickham, Garrett Grolemund. *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*, O'Reilly Media, Inc., 2016. |

### Linear programming - MTH10449

|  |  |
| --- | --- |
| Module designation | Linear Programming |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Assoc. Prof. Nguyen Le Hoang Anh,  MSc. Nguyen Manh Truong Giang |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, do exercises, group work |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: Lectures: 45 lectures hours + 30 exercises hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Provide students with the tools to solve the linear programming problem, distinguish the types of problems, the original monomorphic, dual, and synthetic methods. How to build models from real problems. |
| Content | Objective function, constraint, sign constraint, vocabulary, basis solution, extreme point, primal simplex method, duality. |
| Examination forms | Mid-term and Final exam: Written exam |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | Phan Quốc Khánh, Trần Huệ Nương, Quy hoạch tuyến tính, NXB Giáo Dục, 2003.  V. Chvatal, Linear Programming, NewYork, 1983. |

### Optimization Algorithms - MTH10450

|  |  |
| --- | --- |
| Module designation | Optimization Algorithms |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Assoc. Prof. Vo Si Trong Long |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works, group work |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: Lectures: 45 lectures hours + 30 lab works hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Provide students with knowledge and methods to solve constrained and unconstrained optimization problems. |
| Content | 1. Basic properties and concepts of algorithms, Direct/Indirect line search method for unconstrained optimization problem. 2. Deep reduction method, gradient method and conjugate gradient method. 3. Newton and quasi-Newton methods. 4. The least squares problem. Kuhn-Tucker Optimality Conditions. |
| Examination forms | Mid-term and Final exam: Written exam. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | * + - 1. Polak Elijah, Optimization: algorithms and consistent approximations, Springer, 1997.       2. Schnabel Robert B, Numerical methods for unconstrained optimization and nonlinear equations, SIAM, 1996. |

### Operations Research - MTH10446

|  |  |
| --- | --- |
| Module designation | Operations Research |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | MSc. Nguyen Van Thuy |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, do exercises, group work |
| Workload (incl. contact hours, self-study hours) | 180 Hours  Contact hours: Lectures: 60 hours (in class)  Private study: 120 hours (self-study) |
| Credit points | 4 credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Recommended prerequisites: Linear Programming |
| Module objectives/intended learning outcomes | Provide students with knowledge and applications of linear programming problems in the form of graphs, networks, and some practical applications. |
| Content | * 1. Basic concepts of graphs and trees.   2. Algorithms of network problems.   3. Network diagram methods.   4. Concepts of transport problems and algorithms. |
| Examination forms | Mid-term and Final exam: Written exam |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | Phan Quốc Khánh, Vận trù học, NXB Giáo Dục, , 2004.  Phan Quốc Khánh, Trần Huệ Nương, Quy hoạch tuyến tính, NXB Giáo Dục, 2003. |

### Social Network Analysis - MTH10624

|  |  |
| --- | --- |
| Module designation | Social Network Analysis |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Dr. Tran Anh Tuan |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Data Structures and Algorithms |
| Module objectives/intended learning outcomes | Students who complete this course can:   1. Apply document reading, report writing, and presentation skills. 2. Understand social network models (small world and Barábasi-Albert models) and information diffusion and spread models on social networks. 3. Use social network models in real-life social network analysis. 4. Understand the steps to build a recommendation system based on analytical information on social networks. 5. Apply learned knowledge to develop practical applications with social networks. |
| Content | This module includes the following topics:   * + - 1. Review graph theory       2. Metrics in the network       3. Network models       4. Community analysis       5. Diffusion of information in social networks       6. Influence and engagement       7. Recommendation system in social networks |
| Examination forms | Final exam: written exams |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main textbook: Social Media Mining: An Introduction, Draft version, Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu, Cambridge University Press, UK, 2014  References:   1. Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Draft version, David Easley and Jon Kleinberg, Cambridge University Press, UK, 2010. 2. Introduction to Mining and Analyzing Social Media Minitrack, Dave King, Hawaii International Conference on System Sciences, Jan. 2013 3. Introduction to the Special Issue: Mining social media, Cortizo, José Carlos; Carrero, Francisco M.; Gómez, José María, International Journal of Electronic Commerce, Spring 2011, Vol.15(3). 4. Introduction to Data Analytics and Data Mining for social media Minitrack, Haughton, Dominique M.; Xu, Jennifer J.; Yates, David J.; Yan, Xiangbin, Hawaii International Conference on System Sciences, Jan. 2016 |

### Mathematical Finance Models - MTH10203

|  |  |
| --- | --- |
| Module designation | Mathematical Finance Models |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Nguyen Dang Minh |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, do exercises, group work |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours: lectures 45 hours + 30 practical lessons in laboratory.  Private study: 90 hours (self-study). |
| Credit points | 4 credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Knowledge:   * + - 1. Consolidate basic and advanced knowledge of probability theory to apply to solving problems in insurance and finance.       2. Consolidate knowledge about financial markets and financial instruments as the foundation for building financial models to solve practical problems.       3. Basic introduction to decision making theory.       4. Building financial risk management models.       5. Set up several pricing models.   Skill:   * + - 1. Applying theory to build models suitable to reality, reflecting the nature of relationships in business-finance.       2. Using computer software to support calculations in the subject.   Study attitude: attend school fully and do homework, ensure self-study time at home. |
| Content | This course introduces basic financial models to help students understand and apply financial knowledge to solve fundamental financial problems such as decision making, risk assessment, valuation. … in a way that has a clear scientific basis. |
| Examination forms | Midterm and final exam: written exams. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | Phương pháp mô phỏng số Monte Carlo, Nguyễn Quý Hỷ.  Phương pháp Monte - Carlo và các vấn đề liên quan Ermakov X. M. |

### Database Management System - MTH10344

|  |  |
| --- | --- |
| Module designation | Database Management System |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Tran Anh Tuan  MSc. Nguyen Hien Luong |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | Introduction to Database Systems (MTH10312) |
| Module objectives/intended learning outcomes | Students know how to access knowledge about databases and database management systems: components of the SQL Server database management system and their functions, concurrent access management mechanisms, safety and data recovery after incidents, decentralisation and security. |
| Content | 1. Introduction including definition, functions, properties, architecture of database management system, SQL and Microsoft SQL server 2. Fundamental SQL syntaxes 3. Securing SQL server 4. Stored and manage procedures 5. Creating and managing user-defined functions 6. Creating and managing triggers in SQL server |
| Examination forms | Midterm and final exam: written exam |
| Study and examination requirements | Class-attendance: 5%  Practices and exercises: 5%  Midterm exam: 20%  Final exam: 70%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Mandatory: Slides and lectures.  References:   1. Dương Quang Thiện, SQL Server 2000: Lập trình T - SQL, NXB Văn hóa Sài Gòn, 2007. 2. Ray Rankins, Paul Bertucci, Chris Gallelli, Alex T. Silverstein, Microsoft SQL Server 2005 Unleashed, Sams Publishing, 2007. 3. Brian Knightet al, Professional SQL Server 2005 Administration, Wrox Press, 2007. 4. Paul Turley & Dan Wood, Beginning Transact-SQL with SQL Server 2000 and 2005, Wrox Press, 2006. |

### Introduction to Big Data - MTH10606

|  |  |
| --- | --- |
| Module designation | Introduction to Big Data |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Assoc. Prof. Nguyen Thanh Binh |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab work |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Provides students with foundational knowledge in big data processing. Students will learn basic techniques when handling large volumes of data as well as related databases. In addition, students learn specific applications to apply in future problems. |
| Content | 1. Introduction and overview. Basic knowledge of statistics, R, and Python 2. Types of relationships and representation methods. Non-SQL and SQL Database 3. Graph theory 4. Introduction of Sparks and Foreign languages learning in Sparks 5. Streaming data and introduction of Kafka 6. Introduction of Spark ML libraries. Some applications using Spark ML 7. Search system. Introduction of Page Rank 8. TensorFlow and its applications in real life |
| Examination forms | Final exam: project |
| Study and examination requirements | Practices and in class exercises: 50%  Final project: 50%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Mandatory: Slides and lectures.  References:   1. Jeffrey Dean and Sanjay Ghemawat. 2008. MapReduce: simplified data processing on large clusters. Commune. ACM 51, 1 (January 2008), 107-113. DOI: https://doi.org/10.1145/1327452.1327492. 2. <https://hadoop.apache.org/>. 3. <http://spark.apache.org/> 4. <https://pandas.pydata.org/> |

### Advanced Artificial Intelligence - MTH10356

|  |  |
| --- | --- |
| Module designation | Advanced Artificial Intelligence |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Assoc. Prof. Nguyen Thanh Binh |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | This course will present topics in Artificial Intelligence (AI). We will begin by defining the term "software agent” and discussing how software agents differ from programs in general. We will then look at those problems in the field of AI that tend to receive the most attention. Different researchers approach these problems differently. |
| Content | This module includes the following topics:   * + - 1. Solving Problems by Searching       2. Knowledge Representation and Reasoning |
| Examination forms | Final exam: written exams |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main textbook:  Stuart J. Russell and Peter Norvig, Artificial Intelligence a Modern Approach, Prentice Hall, ISBN D-IH-IQBSOS-E  References:  Stuart J. Russell and Peter Norvig, Artificial Intelligence a Modern Approach, Prentice Hall, ISBN D-IH-IQBSOS-E: An e-copy of the book will be available on the class website. |

### Parallel Programming - MTH10352

|  |  |
| --- | --- |
| Module designation | Parallel Programming |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Prof. Le Hoai Bac |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Data Structures and Algorithms (MTH10405) |
| Module objectives/intended learning outcomes | Through this module, students will have the opportunity to master basic definitions/concepts related to the following topics: the role of parallel processing in everyday life, problems that need to be solved in Parallel processing on computers, Tesla multi-core high-level parallel hardware architecture, CUDA parallel programming model combined with Tesla architecture, applications of parallel programming in scientific research and applications in life. In addition, students will be equipped with basic parallel programming skills using C and CUDA language on Windows/Linux platforms and knowledge of common parallel algorithms. |
| Content | This module includes the following topics:  Overview of parallel programming on GPUs  CUDA programming model  Hierarchical memory organization in the CUDA programming model  Tesla Hardware Architecture  Controlling the flow of execution in the CUDA programming model  Typical parallel algorithms with CUDA programming model.  Parallel programming - Experience in algorithm design.  Parallel Programming Style. |
| Examination forms | Final exam: multiple-choice exam (Theory + Practice) |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | * + - 1. Le Hoai Bac, Vu Thanh Hung, Tran Trung Kien, Parallel programming on GPU, Science & Technology Publishing House, 2015.       2. Le Hoai Bac, Pham Hoai Vu, Introduction to CUDA parallel programming on GPU, Ho Chi Minh National University Publishing House, 2012.       3. NVIDIA, CUDA Toolkit Documentation, 2016, http://docs.nvidia.com/cuda/index.html |

### Advance Machine Learning - MTH10354

|  |  |
| --- | --- |
| Module designation | Advance Machine Learning |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Assoc. Prof. Pham The Bao |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture and lab work |
| Workload (incl. contact hours, self-study hours) | 165 hours  Contact hours:  Lectures: 45 hours,  Lab work: 30 hours  Private study: 90 hours (Self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Required prerequisite: Introduction to artificial intelligence  Recommended prerequisite: programming skill |
| Module objectives/intended learning outcomes | This course provides advanced knowledge of machine learning.  Knowledge: mastering the advanced knowledge of machine learning.  Skills: cognitive and practical abilities to use this knowledge in practical problems.  Attitude: Have the right attitude, perspective and awareness about the subject. |
| Content | This module includes the following topics:   1. Depth first, Breadth first, complexity, completeness and optimality of search methods, Implementing DFS and BFS, Iterative deepening search 2. Using heuristics for search, hill-climbing, best-first, beam search 3. Optimal paths, Branch and Bound, A\* 4. Parallel search, Bi-directional search 5. Games, minimax, Alpha-beta pruning 6. Constraint satisfaction search, Cryptographic problems, Real-time A\*, Iterative-deepening A\* 7. Knowledge Representation and Reasoning: Building a Knowledge Base: Propositional logic, Predicate logic, Theorem Proving. |
| Examination forms | Class discussion; mid-term and final term exam: written exam. |
| Study and examination requirements | Class - attendance: 5%.  Discussion, exercises, practices: 5%.  Midterm exam: 20%  Final theory exam: 70%.  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main books:   1. Tom M. Mitchell, Machine learning, 1997. 2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2010: http://aima.cs.berkeley.edu/python/readme.html   Reference:  Trần Trọng Khiêm, Statistical machine learning approaches to credit risk, 2015. |

### Data visualization - MTH10608

|  |  |
| --- | --- |
| Module designation | Data Visualization |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Dr. To Duc Khanh |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works, group work |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | The course provides students with a comprehensive understanding of data visualization. It equips them with the skills to identify data types and select appropriate methods and tools for visually representing data in a clear and intuitive manner, maximizing support for further analytical insights. Additionally, students will develop proficiency in using Power BI for data visualization.  Knowledge: Gain a solid understanding of the fundamental principles of data visualization and the various types of charts used in the process.  Skills & competences: Apply core principles effectively to create suitable visual representations. Develop the ability to choose the right chart for different data types and analytical purposes. Gain proficiency in using Power BI to create visualizations. Through laboratory activities and group work, the student will be able to:   1. recognize and appropriately describe the case study; 2. identify the appropriate visualiazion methods; 3. team work; 4. develop visualiazion skills and independent judgment; 5. develop communication skills. |
| Content | This module includes the following topics:   1. Introduction to data visualization (coordinate systems and axes, color scales). 2. Visualizing a single variable (quantitative and qualitative variable: amount, proportion). 3. Visualizing multiple variables (scatterplots, correlograms, dimension reduction). 4. Visualizing trends (smoothing, time-series). 5. Visualizing uncertainly (distribution, confidence regions). |
| Examination forms | Midterm exam: written exams.  Final exam: project. |
| Study and examination requirements | Class-attendance: at least 70%.  Overall grade: minimum 5.0/10.0. |
| Reading list | References:   1. Claus O. Wilke. *Fundamentals of Data Visualization*, O’Reilly Media, 2019. 2. Knaflic, Cole Nussbaumer. *Storytelling with Data: A Data Visualization Guide for Business Professionals*, 2015. 3. Devin Knight, Erin Ostrowsky, Mitchell Pearson, Bradley Schacht. *Microsoft Power BI Quick Start Guide: The Ultimate Beginner's Guide to Data Modeling, Visualization, Digital Storytelling, and More.* Packt Publishing Limited, 2022. |

### Numerical Methods for Data Science - MTH10607

|  |  |
| --- | --- |
| Module designation | Numerical Methods for Data Science |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Nguyen Thi Hoai Thuong |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | General objective: Present numerical methods for processing multidimensional signal data in data classification or object recognition, data mining, data analysis, statistics, machine learning, etc.  The main content of the program will present mathematical ideas of numerical methods in data science. Students will then apply knowledge to solve major exercises.  Specific objectives/subject output standards:   1. Knowledge: Master the basic knowledge of numerical methods in data science. 2. Skills: analyse and apply algorithms in practice. 3. Attitude and diligence: have the right attitude, perspective, and awareness about the subject. |
| Content | 1. Learning theory 2. Linearity 3. Multiplicative weights and online learning 4. Optimization 5. Regression and its analysis 6. Graphical Models 7. Algorithms for massive data sets |
| Examination forms | Midterm and final exam: written exam |
| Study and examination requirements | Class-attendance: 5%  Practices and exercises: 5%  Midterm exam: 20%  Final exam: 70%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Mandatory: Slides and lectures.  References:   1. Boyd S. Vandenberghe L., Convex Optimization, Cambridge 2009. 2. Avrim Blum, John Hopcroft, Ravindran Kannan, Foundations of Data Science, Cambridge University Press 2016. |

### Deep Learning for Data Science - MTH10622

|  |  |
| --- | --- |
| Module designation | Deep Learning for Data Science |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | Dr. Huynh The Dang |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works, project |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | This module provides students with basic knowledge about deep learning. Students will be introduced to the current achievements of deep learning and the reasons that led to this. Students will learn and implement deep learning models: fully connected multi-layer neural networks for general data, convolutional neural networks for image data, and recurrent neural networks for data. sequence data. Students will also learn about methods that help improve the quality of deep learning models. |
| Content | This module includes the following topics:   * + - 1. Neural networks and deep learning: Introduction to deep learning       2. Basic neural network       3. Shallow neural network       4. Deep neural network       5. Deep neural network improvements: Regularization       6. Optimization       7. Select hyperparameters       8. Deep learning with image data: Convolutional networks       9. Case studies on convolutional network architecture       10. Convolutional network for object detection problem (object detection)       11. Some applications of convolutional networks       12. Deep learning with sequence data: Regression network       13. Word embedding       14. Attention mechanism |
| Examination forms | Final exam: project |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main textbook:  Recommender systems. Cham: Springer International Publishing, Aggarwal, C. C., 2016.  References:  Series of online courses “Deep Learning Specialization”, link: https://www.deeplearning.ai/deep-learning-specialization/ |

### Recommender System - MTH10623

|  |  |
| --- | --- |
| Module designation | Recommender System |
| Semester(s) in which the module is taught | 6th semester |
| Person responsible for the module | MSc. Huynh Thanh Son |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lab works, project |
| Workload (incl. contact hours, self-study hours) | 165 Hours  Contact hours:  Lectures: 45 hours (in class)  Practice: 30 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6.5 ETCS) |
| Required and recommended prerequisites for joining the module | Introduction to Artificial Intelligence |
| Module objectives/intended learning outcomes | Recommender systems provide personalized access to information about product catalogues, social networks, and collections of documents. This course will introduce learners to approaches for building recommender systems, including Collaborative Filtering, Content-Based, Knowledge-Based, and Hybrid methods. Students will implement recommendation algorithms using open-source toolkits and conduct experimental evaluations. |
| Content | This module includes the following topics:  Introduction to Recommender Systems  Neighbourhood-based Collaborative Systems  Model-based Collaborative Recommendation  Content Based Recommender Systems  Knowledge - Based Recommender Systems  Ensemble-Based and Hybrid Recommender Systems.  Evaluating Recommender Systems |
| Examination forms | Final exam: project |
| Study and examination requirements | Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)  Final score is greater or equal to 5.0/10.0 |
| Reading list | Main textbook:  Aggarwal, C. C. Recommender Systems: The Textbook.  References:   1. Pramod Singh. Machine Learning with PySpark\_ With Natural Language Processing and Recommender Systems. 2. Kim Falk. Practical Recommender Systems. |

### Seminar on Data Science - MTH10620

|  |  |
| --- | --- |
| Module designation | Seminar on Data Science |
| Semester(s) in which the module is taught | 7th semester |
| Person responsible for the module | Assigned lecturers of the Faculty of Mathematics and Computer Science, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Seminar, project |
| Workload (incl. contact hours, self-study hours) | 150 Hours  Contact hours:  Discussion: 60 hours (in class)  Private study: 90 hours (self-study) |
| Credit points | 4 Credits (6 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | Learn more deeply about your major with greater self-study under the guidance of a lecturer and prepare to write a graduation thesis.  Specific objectives/subject output standards:   1. Knowledge: provides additional knowledge that is more extensive than the subjects in the major. 2. Skills: prepare skills for deeper learning and research, such as: self-study, group discussion, writing reports/presentations, arguing/justifying/defending opinions, how to find and use resources related references. |
| Content | Students will work directly with faculty on a topic. Topic content can be:   1. Issues that have not been mentioned in the subjects of the major. 2. Problems arise in specialised subjects but have not been resolved. 3. The necessary knowledge is not included in the program to prepare for the expected graduation thesis topic. 4. The problems of the subject will be assigned by the lecturer for students to explore, research and present. Applicable forms: 5. Under the guidance of instructors, students choose a topic and register for research tasks, then report back. Instructors analyse and evaluate results. 6. The lecturer selects and presents the problem. Students present their understanding of that issue. |
| Examination forms | Final exam: project or representation. |
| Study and examination requirements | Class-attendance: 15%  Discussion and practices: 35%  Final exam: 50%  Final score is greater or equal to 5.0/10.0 |
| Reading list | Depends on the assigned topics. |

# **3. Graduation works**

### Graduation Thesis - MTH10595

|  |  |
| --- | --- |
| Module designation | Graduation Thesis |
| Semester(s) in which the module is taught | 8th semester |
| Person responsible for the module | Assigned lecturers of the Faculty of Mathematics and Computer Science, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Project, seminar |
| Workload (incl. contact hours, self-study hours) | Total workload: 300 hours  Contact hours: 30 hours  Private study including examination preparation, specified in hours: 270 hours |
| Credit points | 10 credits (20 ECTS) |
| Required and recommended prerequisites for joining the module | Successfully completed 96/131 Credits |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Point out the research problems 2. Apply fundamental knowledge and theories to analyse the research problem; develop a research framework (model if applicable); and design a solution for the problem 3. Use appropriate techniques for solutions. 4. Demonstrate the scientific contribution and practical relevance of the research carried out. 5. Provide a consistent, well-structured Bachelor Thesis 6. Plan and manage learning process 7. Present and defend results of the thesis at the Students’ Bachelor Thesis conference. |
| Content | Various topics |
| Examination forms | Graduation report |
| Study and examination requirements | Final-term exam: 100% |
| Reading list | Diverse and depends on the supervisors. |

### Internship - MTH10549

|  |  |
| --- | --- |
| Module designation | Internship |
| Semester(s) in which the module is taught | 8th semester |
| Person responsible for the module | Assigned lecturers of the Faculty of Mathematics and Computer Science, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Instructions, hands-on activities |
| Workload (incl. contact hours, self-study hours) | Total workload: 180 hours  Contact hours (lectures, exercises): 90 hours  Private study including examination preparation, specified in hours: 90 hours |
| Credit points | 4 Credits (6 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Apply knowledge, skills in mathematics/applied mathematics/computer science to practice with real-life problems in company, industry. 2. Self-orient in the desired professional field. 3. Understand the impact of mathematics and computer science in a global, economic, environmental, and societal context. 4. Conduct work responsibly in cooperation with others. 5. Write and present a report in an adequate format. |
| Content | 1. Attendance: Students should attend 100%. Attendance will be regulated and checked. 2. Individual Assignments: Tasks are assigned by the industrial company. 3. Internship: At a company in the field corresponding to the registered major. |
| Examination forms | Internship report, Oral presentation |
| Study and examination requirements | Internship certificate issued by the company: 50%  Written report and presentation graded by the faculty supervisor: 50% |
| Reading list | Depending on the assigned tasks and instructors. |

### Soft Skill - MTH10626

|  |  |
| --- | --- |
| Module designation | Soft Skill |
| Semester(s) in which the module is taught | 8th semester |
| Person responsible for the module | Assigned lecturers of the HCMC University of Technology and Education |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Instructions, conversation, hands-on activities |
| Workload (incl. contact hours, self-study hours) | Total workload: 60 hours  Contact hours (lectures, exercises): 30 hours  Private study including examination preparation, specified in hours: 30 hours |
| Credit points | 3 credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Know the rules of conduct necessary in normal communication situations. 2. Prepare a piece of content for a personal presentation. 3. Resolve all kinds of conflicts in the process of teamwork. 4. Apply non-verbal communication elements in personal presentations. 5. Understand the necessary attitudes in normal communication. 6. Demonstrate the scientific contribution and practical relevance of the research carried out. 7. Understand the necessary attitudes while participating in presentations. 8. Have a sense of fulfilling assigned responsibilities when joining a group. |
| Content | 1. Attendance: Students should attend 100%. Attendance will be regulated and checked. 2. Individual Assignments: 4 presentations about a personal ability, a story, a technology product, a work of art. 3. Mid-term examination: a group project about a social problem 4. Final-term examination: 2 group projects about global citizen and a future technology idea. |
| Examination forms | Oral presentation |
| Study and examination requirements | Assignments and mid-term exam: 50%  Final-term exam: 50% |
| Reading list | Depending on the assigned tasks and instructors. |

### Entrepreneurship - MTH10627

|  |  |
| --- | --- |
| Module designation | Entrepreneurship |
| Semester(s) in which the module is taught | 8th semester |
| Person responsible for the module | Assigned lecturers of the Faculty of Interdisciplinary Science, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Elective |
| Teaching methods | Instructions, hands-on activities |
| Workload (incl. contact hours, self-study hours) | Total workload: 120 hours  Contact hours (lectures, exercises): 60 hours.  Private study including examination preparation, specified in hours: 60 hours |
| Credit points | 3 credits (5 ECTS) |
| Required and recommended prerequisites for joining the module | None |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Observe, explore and detect problems, thereby coming up with creative solutions to solve problems, conducting prototypes, testing, sharing and learning from experience. 2. Provide an independent, proactive, creative working environment, leadership skills, communication skills, cooperation, teamwork, organization, and leadership to adapt to the new environment. |
| Content | 1. Attendance: Students should attend 100%. Attendance will be regulated and checked. 2. Individual/Group Assignments: Tasks are assigned by the industrial company. |
| Examination forms | Report, Oral presentation |
| Study and examination requirements | Progress engagement: 20%  Written report: 30%  Presentation graded by the faculty supervisor: 50% |
| Reading list | Depending on the assigned tasks and instructors. |

### Graduation Project - MTH10597

|  |  |
| --- | --- |
| Module designation | Graduation Project |
| Semester(s) in which the module is taught | 8th semester |
| Person responsible for the module | Assigned lecturers of the Faculty of Mathematics and Computer Science, University of Science, VNU-HCM |
| Language | Vietnamese |
| Relation to curriculum | Compulsory |
| Teaching methods | Project, seminar |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 hours  Contact hours: 75 hrs  Private study including examination preparation, specified in hours: 120 hours |
| Credit points | 6 credits (12 ECTS) |
| Required and recommended prerequisites for joining the module | Successfully completed 96/131 credits |
| Module objectives/intended learning outcomes | After completing the course, students will be able to:   1. Point out the research problems 2. Apply fundamental knowledge and theories to analyse the research problem; develop a research framework (model if applicable); and design a solution for the problem 3. Use appropriate techniques for solutions 4. Demonstrate the scientific contribution and practical relevance of the research carried out 5. Provide a consistent, well-structured report 6. Plan and manage learning process 7. Present and defend results of the project at the Students’ Seminar Conference. |
| Content | Various topics |
| Examination forms | Presentation, report |
| Study and examination requirements | Minimum attendance at lectures is 80%.  Final-term exam is 100%. |
| Reading list | Depending on the instructors |